SCIENCE

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*THE RELATION OF THE AMERICAN SOCIETY OF NATURALISTS TO OTHER SCIENTIFIC SOCIETIES.**

WITH the first year of the new century new conditions have arisen which profoundly affect all problems of cooperation between the national scientific societies. The project which emanated from the American Association for the Advancement of Science to establish Convocation Week has made, as you all know, so great progress that we are now meeting for the first time in this week set apart by the action of numerous universities for the purpose. The Association also has sought to establish wider and more numerous affiliations, such as long existed between it and several important national societies. For many years it has been the rôle of the Society of Naturalists to act as the organ of affiliation for societies which are concerned with the various branches of natural history, and which have been accustomed to meet during the Christmas recess. But the Association is now intending to meet at this period and we may safely entrust the function of establishing affiliation between the representatives of the various sciences in America to this larger body which can include all the branches of science.

A few words as to the history of our

* Annual discussion before the Chicago meeting of the American Society of Naturalists and Affiliated Societies.

Society. It was founded in 1883 under the title of the Society of Naturalists of the Eastern United States. It owes its birth to the action of Professor Hyatt in formulating and proposing the plan, in accordance with which the Society was actually organized, and in interesting others in its establishment. The first secretary was Professor S. F. Clark, now of Williams College. The first meeting was a small gathering at Springfield, Mass., on the 10th of April, 1883. Unfortunately Professor Clark was obliged to resign his office as he was going abroad. For some time it seemed doubtful whether the Society would get beyond its first meeting. I was then asked by Professor Hyatt to act as secretary, and during the remainder of that year I carried on an extensive correspondence with the professional naturalists of the country and nearly all of those who were invited accepted membership.

It was then decided to hold a meeting in New York, December 27 and 28 of that same year. We started with 109 original members, of whom there still remain in the Society not less than 39. At the close of the first meeting the membership had risen to 133 and we have now nearly 250. The original scope of the Society was to have papers on methods of investigation, on technique, on museum administration and devices and on methods of instruction; and in fact at our early meetings many such papers, both of value and of interest, were presented. In 1886 the name was altered to '*The American Society of Naturalists.*' You are all familiar with the gradual change which has come about and know that at present our functions at our annual gatherings are confined to a discussion on some topic of general interest, to a social dinner and to the presidential address. Many of these addresses in the past have been of a noteworthy character, and we are anticipating an address from our president this year which will well sustain the high standard set by even his most distinguished predecessors.

The most important achievements of the Society have been somewhat different from what was foreseen at the time of its organization. It has, of course, accomplished a great deal in the general promotion of natural science. Its meetings have done that. But perhaps more important than this somewhat general fact have been certain specific results which have been attained by the Society. It was, I think, the very first society of national scope which confined its membership strictly to professional scientific investigators, and the rule adopted by the Society for determining what constituted a professional naturalist was very strict and has been well enforced. Many other societies have this same quality of membership, having, in many different branches of science, been formed from our example. Collectively they represent the very best that there is at the present time in American productive scholarship. We may, therefore, claim as one of our most essential and significant achievements the generation of our affiliated daughter societies. They are all characterized by a seriousness of purpose and intensity of scientific work, which can not by any means be always matched by what one encounters in the meetings of foreign societies. Our American societies to which I have referred meet for earnest, scientific discussion. They take but little time for anything else. How striking a contrast there is between the meetings now being held, with each day filled by a long series of valuable papers before each society, and the gatherings, such as many of us have attended in Europe, where a few hours only are kept for the strictly scientific meeting, and many for excursions, picnics and balls. I remember attending an anniversary of one of the oldest scientific societies on the

Continent. The celebration occupied three entire days; the scientific meetings almost four hours. May we not claim it as a merit to thus maintain a higher standard for national scientific meetings than we find in other countries?

Another important contribution of our Society was the introduction of winter meetings. We were the first, I think, to use the Christmas vacation regularly for this purpose. Now many societies use it and experience has shown that it is the best time in the whole year, under American conditions, for the holding of national meetings. It is, therefore, from our example that the demand for the establishment of Convocation Week arose.

The fourth achievement is the introduction of discussions of broader scope in which topics of common interest to those in allied branches of science are debated by high authorities. Such discussions do much to broaden our views and increase our appreciation of the solidarity of all science.

Now as to our future. I have already expressed my conviction that we should resign our function as the central body of affiliation in favor of the American Association, which, being so much larger, and so much wider in its scope, can undertake this work of affiliation on a larger scale and therefore more efficiently. The Association has adopted our plan of meeting during the Christmas holidays so that the substitution will be easy. It seems to those of us who have been interested in these plans that it will be of great value to the science of the country to have from time to time a great gathering, so great that its mere magnitude will impress the public and impress our public authorities. Science has yet to make in this country enormous demands from the public for support before it will attain the proportions which are indispensable for the maintenance of the national welfare. It is a duty, therefore, both to science and to the country, for every scientific man to contribute what he can to make known the needs of science. We depend wholly upon the dissemination of such knowledge for our resources, whether we get them from generous private individuals or by State or national legislation. But it must be remembered further that though affiliation is valuable, bringing together great numbers at one place is not always the wisest plan. Therefore it is necessary that every affiliated society should preserve absolute freedom and that it should be understood between the Society and the Association that the former may meet with the Association or not, as may be deemed expedient each time by the Society. There should be no compulsion from the Association, and I think it will often happen that one or several societies will find it advantageous to meet apart. The only absolute obligation which the affiliated societies ought to assume is the election of one or more delegates to represent the Society upon the Council of the American Association. It is hoped that by this means the Council will become, so to speak, a national senate representing the scientific interests of the country, and representing them very fully. Such a senate will have great influence and may exert its influence from time to time to the advantage of the country. It can speak with authority in regard to problems of legislation, of education and of scientific organization. It might make effective protests, as, for instance, against the outrageous system of duties upon scientific apparatus by which all our work is now impeded; or against the public clamor recently made in one of our States for the reduction of the income of the State University; or against the abuses of arbitrary and ignorant authority at some of our universities, of which we have heard during the last year.

If we resign this part of our work to the American Association, will there remain

enough for us to do to make the perpetuation of our Society desirable? I think clearly, Yes. Even if we could do only what we are now doing—viz., keep up our annual discussion, our dinner and our presidential address—I should say we had in these purposes justification for our continued life. But I believe that we can take up a new task of affiliation which will solve one of the problems which we must solve. It is not enough to have great national meetings. We need besides less formal and more local meetings. The great distances in our country render this important. I should like, therefore, to suggest for your consideration an entirely new plan, viz., that of forming a series of local organizations or branches of our Society. There might be one such organization for example for New England, another for New York, a third for the Middle Atlantic States, a fourth for the Central States and a fifth for the Pacific coast. Each one of these branches could hold meetings for the presentation of scientific papers and invite to the meetings all the local members of the societies now affiliated with us. These meetings might last one or two days and could be held at a time of year when they would not in any way compete with the larger national meetings during Convocation Week. In that way the freedom of the individual societies affiliated with ourselves will be in no wise affected. Competition between ourselves and the American Association will be entirely avoided and the demand, which is real, earnest and well founded, for local meetings, will be answered. It would, moreover, contribute usefully towards the general organization of science throughout the country. That organization I believe to be of the greatest importance. If we look back on the history of science in this country we should probably all agree that the most important step ever taken to promote it has been the establishment of what are commonly called post-graduate courses at our principal universities; because these courses offer varied and excellent opportunities to train young men seeking discipline in science in order to become scientific investigators. But may we not say that to form a wide-reaching organization of science, national in extent and power, is a yet more important step destined to rank among the great achievements of the century upon which we are just entering? We have learned from our political organizations that numerous independent states and a central government work harmoniously and increase by their cooperation and power the welfare of all. So in our organization of science let us profit by this political example, and though we favor the organization and the strengthening of the central power, let us never forget that every body of men which joins in the organization must also be free. If we make 'freedom and affiliation' our watchwords, we shall escape many perils and conquer success.*

Charles Sedgwick Minot.

I shall speak to the following motion: Resolved, that the American Society of Naturalists authorizes the naturalists of the Central and Western States to organize a branch of that Society to meet at Chicago. That a committee of three be appointed by the president to arrange the details of the relation of the Eastern and Chicago branches and to provide for a joint meeting of the two branches at intervals of two or three years alternately in eastern and central territory. I shall not take time to argue the importance of annual meetings

* The original address was delivered from brief notes, with no thought of publication. In writing the article I found it impossible to recall the original discourse accurately, but I think the substance of it is unchanged except that certain parts of momentary or local interest have been omitted. C. S. M.

of naturalists. I shall not try to show how they aid in the development of science. All of us are willing for the love of research to work ten to fifteen hours a day; but it is the coming meeting at which we have announced a paper that stimulates us to work all night. Furthermore, as scientific men have no longer time to read, if it were not for this annual treatment of fifty doses of papers taken in fifty quarter hours we should be more ignoramuses than savants. I assume, therefore, that it is agreed that naturalists should get together once a year.

The question is: How inclusive should these meetings be? Some naturalists, even of the Mississippi Valley, urge that all of the naturalists of the country should meet together every winter. That is not practicable. As evidence it is only necessary to point out that if it were possible it would have happened already. As a matter of fact, the proportion of naturalists from the Central States attending the meetings of the American Society has always been small. At the present meeting, despite the most cordial interest of the eastern naturalists, we are all regretting the absence of many of our eastern friends and colleagues. Again, the experience of the American Association for the Advancement of Science proves that the great majority of the naturalists of one section of the country will not exceed a certain limit of time and expense to attend meetings in another section. At the Boston meeting of the Association 666 members, or about 74 per cent. of those in attendance, were from the Middle and New England States. At Denver, with great attractions for a summer meeting, there were 82 such members in attendance, or 27 per cent. of all attending. From the nature of the case you can't draw definite limits of distance and expense for the regular attendance of naturalists on meetings. But experience indicates that most naturalists will not travel regularly more than for about fifteen hours to attend a meeting, nor spend more than fifty dollars. In other words, an institution that will regularly send a majority of its naturalists to a meeting must be within 500 miles of the place of meeting. These facts teach that it is futile to hope that all naturalists of this country will meet regularly together; or even that those east of the Rocky mountains will do so.

A second proposition is that the Naturalists' meeting should be held in successive years in different sections of the country to meet the needs of the naturalists located in those sections. Thus, it might meet successively in New York, Chicago, Denver and San Francisco.

The objections to this plan are too obvious to require debate. It does away with the precious opportunity of an annual meeting of the naturalists of any one section of the country. Local societies would spring up to fill the need and the American Society would be sapped of its strength by them. The advancement of science demands that naturalists gather at least once a year.

A third proposition was made by a committee of the American Society of Naturalists at its last meeting. It is that the name 'American Society' should be abandoned. That the eastern society should reassume the name of 'Society of Naturalists of the Eastern United States,' with which it started. That the naturalists of the Central States might then form an independent and coordinate society. This plan would be a good one, perhaps, if the central and eastern sections were sharply marked off from each other or were politically distinct as, thank God, they are not. The Boston naturalist of this year will very likely be located in Chicago next year and the Michigan naturalist of a decade ago is a scientific leader in New York to-day. We change houses with facility, but we do not change

the flag to which we owe allegiance and we don't want to change more than possible our scientific comradeship. We of the Mississippi Valley, if called east at Christmas time, would like to be able to attend the eastern meeting of naturalists as rightful members; and if any eastern naturalist (pro tempore) were in Chicago or vicinity at the time of our meeting, it would give us pleasure to realize that it would be his meeting also. We don't want to have the naturalists of the country artificially separated by geographical boundaries.

The fourth proposition is based on the national political principle. It suggests the organization of local, self-governing branches bound together by a central organization. For the present two of these branches seem necessary—one meeting in the east; the other at Chicago. It is proposed, further, that the two branches should meet together every third year, that is, once in six years we in the west will go east, and once in six years the east will come to the west. We should all try to attend these joint meetings, thus to renew old acquaintances and to make new ones. It may, however, appear better to try to meet together every other year; I trust we shall have a discussion of that point.

I have assumed above that the central naturalists will meet in Chicago. This is a local matter, but I take this occasion to refer to the fact that if we draw a circle of 500 miles radius, having Chicago as a center, it includes 99 per cent. of the naturalists who have met here in the past and it is generally agreed, I think, that no other point in the Central States would be so convenient to so many.

The plan here proposed has been opposed on the ground that it means disunion and tends towards the breaking up of the American Society. Precisely the opposite will be the effect. By this plan some hundred or more naturalists of high rank in the Central States will be added at once to the membership of the Central Society which will then become truly an *American* Society of Naturalists. At the same time that *continuity* of work that depends on a regular attendance of members will be gained.

C. B. Davenport.
University of Chicago.

In viewing the relations of American scientific societies in general, and of the American Society of Naturalists in particular, it is needful to occupy some platform; and since the limitations of time will permit no more than a hasty glance, a platform of two planks may suffice. The first of these has to do with the rate of progress of American science, and the second is connected with the trend of this progress; for it is not to be forgotten that while the maker of things moving begins with direction and proceeds toward rate, the interpreter of natural movement begins with rate and then proceeds to ascertain trend or direction—nor is it to be forgotten that the study of institutions is still in the interpretative stage. So the first plank may be defined as Advancement, while the second may be called Coordination.

To one in the thick of the turmoil it is not easy to keep note of the tremendous rate of scientific progress in America during recent years; for no adequate units of measure of intellectual activity and attainment have yet been devised. A suggestion may be found in the development of university facilities, since our universities partly lead and partly reflect our progress in science. Without tabulating the statistics in detail, it would seem safe to say that during the first half of the nineteenth century—*i. e.*, from 1800 to 1850—the university facilities of the United States were doubled; that during the next quarter-century, from 1850 to 1875 (despite the shock

of the Civil War—perhaps partly by reason of it) they were doubled again; that from 1875 to 1890 they were once more doubled; and that during the last decade of the old century the doubling was again repeated, so that the nineteenth century went out with at least sixteen times the university facilities (including endowments, etc.) of her incoming. Nor is this the end; for present indications are that our university wealth will double again within the first five years of the new century. Even this is not all; for the fin de siècle university is scientific—an institution for research into the unknown as well as for the preservation of the known—in far larger degree than was the university of 1800. So the university mete shows that American science is advancing in a geometric ratio, an increasing rate in which the rate of increase is still increasing with increasing rapidity. Any other measure gives similar results: Reckoning what may be called state science in terms of appropriations for its maintenance, the growth, from Olmsted's Geological Survey of North Carolina, beginning in 1823 at $250 per year, to our present two-score of state surveys and related institutions, has been even more vigorous than that of our universities; while our direct federal appropriations for scientific work, beginning with a few hundreds in 1811, passing the million mark about 1870, and now rising above ten millions annually, give eloquent testimony of national advance in knowledge-making at an ever-increasing rate. A still more striking measure is afforded by the growth of our scientific societies—or will be when the statistics are tabulated. Yet all these measures, impressive though they be, are little more than symptoms attending the permeation of a healthful serum throughout the body of American citizens; for our average citizen, whose ancestors in 1800 planted potatoes in the dark of the moon and sniffed witchcraft and black art afar, is now a devotee of the methods of science as well as of rational interpretations of nature, and looks to the Agricultural Department or the Smithsonian Institution or the neighboring university for standards of practical thought—even if he half complies against his will, and is half of old opinion still. It is a hopeful sign of the times that American science, measured by any standards, is advancing more rapidly than our fast-growing population or quick-increasing national wealth—that it is indeed drifting into its true place in the lead of our industrial development. Such is the Advancement of American science.

Turning now to Coordination: The advance of science is largely—indeed wholly, in the last analysis—dependent on social development; and the law of social development is integration. The ways along which integration proceeds are many: The growth of the family into the clan and of the clan into the tribe, and the union of tribes into confederacies, with the ultimate welding of these into nations, all represent a process of integration peculiarly instructive to students of institutions, scientific and other; the steady breaking down of racial barriers, the world-wide blending of blood and culture, the merging of laws and languages, and the diffusion of cults (whether of faith or of works) according to their fittingness for the several stages of intellectual development, all represent ways of social integration—ways whose name is legion, and whose ramifications and osculations it were needless now to follow. Yet he who would fairly view the growth and relations of our voluntary associations for scientific research can not afford to neglect the analogy of primitive society in its growth from clan to tribe, and thence on and upward along the noble course of intellectual strengthening and human betterment. Now the germ of the clan is a

family bound by ties of common interest; and its analogue in scientific organization is the group of kindred spirits working to a common end, like the half-dozen geologists who later formed the American Society of Geologists, the precursor of the American Association for the Advancement of Science. The clan itself is an enlarged family, comparable to the same half-dozen geologists and their fellows when the magnet of knowledge-making drew them into the closer union of definite organization; while the tribe may be likened to the permanent association defined and bound by articles and constitutions and by-laws. The likeness between the primitive tribe and the society of specialists is much more than a fanciful parallel—indeed the analogies are many and close, too many for counting and too close for discussing in brief space; it must suffice to accept the analogy and pass to the application. The significant point is that the tribe, after reaching a certain (*i. e.*, uncertain) magnitude, either multiplies by fission (breaks down beneath its own weight, in other words) and so forms subtribes which are eventually confederated on the basis of higher laws, or else passes directly into more or less definite confederation with alien tribes. It is no less significant that the confederated tribes long retain their integrity, just as do the component clans in many instances and the constituent families in all; so that the confederacy becomes a sort of hierarchy of interdependent groups, presaging the interdependent townships, counties, wards, municipalities, judicial districts, representative districts, States, and other collective units of enlightened society. Now accepting the analogy between the tribe and the voluntary scientific association, the application is simple; the association may either multiply itself by fission (*e. g.*, into sections), or in some other way prepare for reorganization on a more comprehensive plan; yet the broader organization need not interfere with the original affinities and affiliations, any more than the Seneka Indian was made less a Seneka by the Iroquois confederation, or the citizen of Chicago is less a Chicagoan because he is a native of Illinois and a citizen of the United States—as well as a Mason, a Presbyterian, and a free-trade Republican. The plank of social integration is too broad and too long for easy trimming into a three-minute platform; but fortunately it tells half the story in itself.

Such are the great fact and the fundamental principle to be borne in mind in our search for the best way of future progress for the American Society of Naturalists—the fact of unparalleled Advancement, and the principle of institutional Coordination.

The Society of Naturalists is conspicuous among American scientific societies in many ways, notably for its habitual exaltation of the scientific spirit above the letter of organic law and hence for unprecedentedly rapid and vigorous growth—indeed this Society, more than any other, may be regarded as the type and expression of modern scientific activity in America. Founded primarily to meet the needs of serious students of science, incidentally as a foil if not an antidote for the peripatetic pleasuring and jocose junketing charged against an older organization, it has kept even pace with the tremendous scientific progress of the last two decades, and has become a leading power in guiding scientific thought and shaping scientific policy. Naturally, in view of its phenomenal growth, it reveals signs of that fission whereby all social institutions prepare for reintegration on a higher plane. True, the laxity of the law is such that the original organization is not unduly constrained; yet, as a nucleus for a group of affiliated societies, its vitality is diffused to the benefit of the group rather than concen-

trated in the sole interest of the unit. The career of the Society from 1883 up to the present seems to have been normal, fully in accord with the times, and beyond reproach; its present function as a nucleus for special societies—*i. e.*, subtribes, in the analogy with primitive socialry—would also seem to be ideal; yet the question arises, May not the naturalists assume a larger rôle on the stage of American science? And this in turn evokes another: If so, how?

In seeking answers to these queries, the mind turns at once to broader affiliations and stronger affinities than those already developed within the Society of Naturalists; and among the first of the possible affines, thought rests on the American Association for the Advancement of Science, that older organization of which the younger body is, in some measure, the reciprocal if not the antithesis. It is to be remembered that the Association, also, has reached the stage of fission, or of reintegration on a higher plane, the stage being marked partly by increasing autonomy of the component sections, partly by the affiliation of several special societies, each a power in its specialty and all an immeasurable force in shaping the science of a nation. Originally an agency of diffusion and direct advancement combined, the Association for a time was mainly devoted to the former function; of late, thanks largely to the influence of the affiliated societies, it seems to be resuming the original function of direct advancement through its own activity and through fostering kindred societies, so that its present aims are so nearly akin to those of the Naturalists that the two organizations might well cooperate, or even confederate, for mutual advantage and the common benefit of American science. The possible modes of cooperation, and the possible lines of confederation, are too many for present discussion; but it may be held, in the light of analogy with primitive socialry as in that of current experience, that neither cooperation nor confederation need involve loss of autonomy, or efficiency, or dignity, on the part of either organization.

Out of the many possible lines of action leading to coalition between the two most vigorous and virile of our voluntary scientific societies, one or two may be urged: The American Association for the Advancement of Science has already decided to hold a winter meeting in Washington during the Convocation Week of 1902–3, and it has just been decided by this body to hold its annual meeting at the same time and place. Now it is suggested that the American Society of Naturalists take the requisite steps toward admitting representatives of the Association to its Council, and toward securing representation in the Council of the Association, preferably at this approaching meeting, and if not then, at the earliest possible occasion; it is also suggested that this Society take early steps toward enlarging and strengthening its Council in such manner that the administrative bodies of the two organizations may attain parity of power. It need hardly be said that the joint meeting would serve, and better serve, every purpose of separate meetings; and it need hardly be added that one effect of the joint meeting would be to increase common membership in the two organizations, and thus to strengthen the already strong bonds of common interest.

In another place* it was pointed out that a need of American science to-day is a delegate organization—a Senate of Science—in which our many and constantly multiplying local and special voluntary associations of scientific men might be equitably represented in a body not too large and unwieldy for effective work in coordinating lines of research and keeping in touch with national progress; and it was suggested

* SCIENCE, N. S., Vol. XIV., 1901, pp. 277–280.

that the Council of the American Association might well serve as the nucleus for such an organization. To-day a still more promising nucleus for a national scientific organization of unprecedented dignity and power may be glimpsed through eyes of hope; for it is within bounds to anticipate joint meetings of the Councils of America's two representative organizations of science, and joint action with all the strength of union, at no distant day.

W J McGee.
Bureau of American Ethnology.

It is not long since a gathering as representative of American science as the present one would have been a very different kind of audience. It would have been much smaller, without men enough specially representative of any one branch of knowledge to warrant them in meeting together as a section, but composed of men practically all of whom would have heard with interest and discussed with intelligence any paper on the program.

Recent years have brought about a marked change in science as in other things. Material prosperity has made it possible for more men than formerly to devote themselves to the acquisition and diffusion of learning, and the means and appliances at their hand have increased to no less a degree. With this has come, as a means to the performance of the more difficult tasks of research, specialization and attendant division of labor, so that the scientific organizations are now commonly not only larger, but far more complex, and one often goes away from a meeting with something like an intellectual dyspepsia, induced by the many and extremely varied courses offered on the program.

In another important respect conditions have greatly changed. The time was when the great distances lay beyond the workers in science. To-day, because of the development of the whole country, they lie between the workers, not equally, but in such a manner as to cause a concentrated eastern and a more scattered western population. Though distances are now traveled in hours that formerly required days, the expenditure of time and money involved in passing these great distances is so great as to seriously interfere with the holding of truly national meetings, and I desire to express my full appreciation of the action of this society in setting aside a geographic restriction of its constitution in order that this most successful meeting might be held in Chicago. Shortly before leaving home I received a letter from a friend, in which regret was expressed that the eastern botanists who commonly meet in conjunction with this Society had not felt it wise to set aside a like provision of their own constitution, so that they are now meeting in the east, and adding that, much as would be gained by meeting with the affiliated societies now in session here, it did not seem quite right to depart from their custom and so deprive the younger men, not blessed with a superabundance of this world's goods, of a meeting that they desired and were entitled to, but for which they could not travel far.

In our childhood we all learned the fable of the man who one day brought in an armful of twigs, and, handing them one after another to his son, asked him to break them, which was readily done; but when a like number were closely bound together into a bunch, they could not be broken nor even greatly bent. I believe it was the schoolmaster who first made practical use of this particular demonstration of the strength that lies in union, but before my own time he had abandoned it because of the greater flexibility of the unit. Business men have recently begun to make much and profitable application of the principle, and as, in manufacture and

traffic, material results are quickly available for the testing of changes in organization and management, they are rapidly securing both strength and economy and efficiency of administration, by combination. If the century just closed is likely to stand out prominently in history as that marked by specialization and differentiation, that on which we have just entered appears likely to take place as that in which rational union, coordination and centralized organization form prominent features; and this is likely to be as true of the machinery of instruction and of research as it is of business combinations.

Professor Minot has very thoughtfully and logically presented the bearing of this line of thought on this society and the affiliated organizations. Difficulties may be experienced at first in perfecting the details of the most useful and workable organization, but they are likely to be seen and overcome, and I have little doubt that the great Washington meeting that we are all hoping to attend next winter will initiate a federation of scientific interests that, without losing in productiveness, will gain an almost irresistible strength which will be productive of great good in many ways.

But in this centralization of interests those who can not travel great distances to attend the general meetings should not be forgotten. I feel that while none of us who can attend the great meetings can afford to miss them, those who can not go to them should be given every help and encouragement in holding meetings at places convenient to their homes. I have assumed that your committee, in inviting me to take part in this discussion, did so because they wished the point of view of the central botanists represented. On this assumption I have tried as far as possible to ascertain the feeling of those botanists, and I think I may say without impropriety that the botanists now meeting in connection with this Society feel the need of a local organization, and have taken steps toward its formation, though, in view of the discussion to be held this afternoon, possible action by this Society this evening, and the announcement of a general meeting of the central naturalists called for to-morrow morning, for the consideration of the same question, they have deferred their final action until to-morrow. Whatever they may believe desirable for the furtherance of their more immediate interests, I am confident that their support may be counted on for all wise concentration, and that at all times, those who are able and free to attend the general meetings may be counted on to do so, while those who must stay nearer home will prove willing to act in unison with the central body on all matters of scientific importance where concerted action is needed, while they anticipate no refusal of the full power of the general organization in any matter concerning which it is proper for them to ask support.

WILLIAM TRELEASE.
MISSOURI BOTANICAL GARDENS.

THERE are evidently two subjects under consideration by the Society, and these are only indirectly related. One is the subject of cooperation, affiliation, or more organic union between the American Society of Naturalists and the American Association for the Advancement of Science; and the other is the organization of local branches of the Society of Naturalists, or sectional societies having a similar field and affiliated with that general organization.

Assuming that the time of meeting of the American Association is to be changed to Convocation Week, there seems to be a practically unanimous judgment favorable to a meeting of that society and the Society of Naturalists at the same time and place, and to a close coordination or affiliation of the work of these societies. I can see how

certain practical difficulties would arise from the meeting at the same time and place of two societies or groups of societies so largely similar in character and scope—meetings of the Botanical Section of the American Association, and of the Society of Plant Morphologists affiliated with the Naturalists' Society; meetings of the Zoological Section of the American Association, and of the Society of American Morphologists; and so on—but I presume that these matters have all been considered and that means of adjustment will readily be found. As to the soundness of the idea, I cannot see that there need be any doubt.

With respect to the formation of a local society in the central states, to be affiliated in some way with the group of societies in session here at this time, I think the only subject upon which difference of judgment might possibly arise is that of the method of the affiliation. It seems to me that in the nature of the case we shall finally be forced to form sectional societies in most of the branches of science represented by the existing organizations. As the scientific population of the country becomes more equally dispersed over its whole area, we find this area too large to permit general annual meetings of those most interested and most likely to profit by them. The distances are so great as practically to prohibit attendance upon the part of many members, and the number presenting papers in each society or subdivision is such as to crowd the programs unduly, diminishing the interest and value of the meetings. We need a satisfactory geographical unit of assemblage for scientific meetings, one not so large as to make attendance a burden upon those living on the outskirts, and yet large enough to permit a satisfactory subdivision of the programs of societies into sections corresponding to the subdivisions of the subject matter. From what we have seen during the last two years and at the present meeting, it seems to me quite clear that the states of the Mississippi Valley—now coming to be known as the Central States of the Union—should form one such unit of assemblage. Indeed a society of naturalists has already been formed for this area, and has had two highly successful meetings, definite organization having been delayed merely with a view to the issues of this meeting. Probably other such sectional societies might be organized to advantage (if not now, before many years), all to be associated as divisions of a more general organization for the country as a whole.

On the supposition that such a society is now to be organized here, the subject of its relations to existing societies will come up for settlement. In this connection it is helpful to notice the difference in organization of the Society of Naturalists and that of the American Association for the Advancement of Science. In the former there is one general society which serves as a bond of union for special societies, each independent in organization and management, but associated by affiliation with the general body, the latter being scarcely more than an administrative convenience. In the American Society for the Advancement of Science, on the other hand, there is a more compact general society, with subdivisions, called sections, formed mainly for program purposes. In the American Society of Naturalists we have had, thus far, no sections in the latter sense, but only affiliated societies, and I am inclined to think that this method of organization should be continued as local societies spring up in response to local requirements. I would rather, in short, see the naturalists of the Central States organized under the form of an independent but affiliated body than in the form of a section of the national society.

I doubt also the advisability of attempt-

ing to fix in advance the place of meeting of the proposed new society or section or to determine unnecessarily any detail of its policy by a resolution passed by this body at this time. If its members should prefer peripatetic meetings to those held at one fixed point, I think it should be possible for them so to determine, especially as that is now the policy of the whole group of societies associated in this organization.

I am obliged to you, Mr. Chairman, for the opportunity to participate in this discussion, which I owe to your courtesy only; and I have spoken merely on a few points which have occurred to me as I listened to those who have preceded me.

S. A. FORBES.

UNIVERSITY OF ILLINOIS.

'A HAND apart from the rest of the body is not a hand,' said Aristotle, and modern psychology shows that each of us exists only in his relations to others. Writing and the printing-press have made science possible by permitting intercourse between those separated in time and space, but they have not done away with the necessity for personal contact. Correspondence schools can not replace universities, nor do journals and books make needless the coming together of scientific men. The organization of academies and societies has been an essential factor in the development of modern science. Two or three hundred years ago the men of a neighborhood began to meet to discuss scientific questions. Fifty to a hundred years ago, when railways made it possible, national associations were established. As the sciences became differentiated, the academies and associations met in sections, and special societies were established in each country for different sciences. These societies or their members now meet occasionally in international congresses.

We have indeed at present a somewhat bewildering array of scientific societies which have arisen in answer to special needs. It is time that the methods of science should be applied to their proper coordination. The two closest bonds of union are common interest in a subject and local proximity. We have, as a matter of fact, national societies for nearly every science, and local academies in nearly all our larger centers. When there are enough students of the same subject in the same place we have the natural unit; these groups should unite on the one hand to form the local academy, and on the other hand to form the national society. The national societies should be parts of a great national association. The presentation and discussion of research belong to the special societies; the coordination of the work of different sciences, legislation on behalf of science as a whole, and the representation of science before the intelligent public, belong to the national association. For the transaction of business, this association can no longer be a plebiscite, but must be a house of delegates representing the scientific interests of the country.

The American Society of Naturalists, with which we are at present more especially concerned, represents certain sciences and a certain region; it does not form an integral part of what appears to be the trend of scientific organization. Historically our society has performed a service of immense value. In the limitation of participation in its work to scientific men, in delegating special papers to special societies affiliated with it, in its discussions of questions of general scientific interest, and in its choice of midwinter as a time of meeting, it has set an example to the American Association. In recent years, however, the American Association has maintained the same scientific standard, and we have practically one group of scientific societies meeting in midsummer and an-

other in midwinter. The greater power of a general association is indicated by the fact that all the societies meet in summer under the auspices of the American Association, whereas at present the national societies are meeting not only here in Chicago, but also in New York, Philadelphia, Rochester and Washington. The greater influence of a national association is again shown by the fact that it has been able to secure from our universities and colleges a special convocation week in midwinter. This could not have been accomplished by our Society representing only certain sciences and a certain region.

Hereafter the chief meeting of the American Association will probably be held in convocation week, and the national societies devoted to special sciences will probably meet with it. Our views as to the future functions of the Society of Naturalists depend on how we answer two questions. Should our special scientific societies be national or sectional? Should they meet at the same time and place? To me it seems that the special societies should surely be national, or American, with local sections. A national society for each science will ultimately be essential for purposes of publication and for legislative functions. An annual or occasional meeting of those engaged in the same kind of work is of the utmost importance—scientifically, professionally and socially—and should be maintained in spite of the sacrifices of time and money imposed by the large area of our country. It seems to me further that our national societies should meet together. It is economical to make local, railway and other arrangements, once for all. Most of us belong to more than one society and like to meet friends following different lines of scientific work. Indeed, sharp lines can not be drawn between the sciences; we have astrophysicists, electrochemists, general biologists, physiological psychologists, and the like, who would be divided by separate meetings. There are judicial, legislative and executive functions, in which all men of science should unite, and for their accomplishment a general meeting is essential. Then, lastly, the weight of science is impressed on the general public only by a meeting of sufficient magnitude.

The limits of a thousand words do not permit an attempt to emphasize the importance of national scientific societies and of a general congress of scientific men, and after all the logic of events is the strongest argument. We *have* national scientific societies, and they *do* meet in groups—nearly all the sciences in the summer, with the American Association, and the biological sciences in the winter, with the Society of Naturalists. The meetings of the American Association have, it is true, been interfered with by summer holidays, summer heat and the winter meetings; and the winter meetings of the American Society of Naturalists are threatened with a local division. It seems reasonable, however, to assume that next year, at least, all our societies will meet together at Washington in convocation week.

Supposing there to be a general annual meeting, say once in three years at Washington, once in the eastern states and once in the central or western states, what should be the function of the Society of Naturalists? It seems that the general arrangements should be left with the American Association, covering all the sciences and the whole country, and having permanent and salaried officers. Our society might hold separate meetings in the east when the national societies meet in the west. I myself, however, regard this as undesirable. Should the Society of Naturalists then be disbanded, having accomplished its work? I think not. There is place for a compact organization within

the American Association representing certain sciences and a certain region. The original objects of the Society—the organization of scientific work, the teaching of science, the conduct of museums and the like—still need an organization. Our discussion, our public lecture and our dinner with a presidential address should not lightly be abandoned. Within the Royal Society and the British Association there have been clubs, primarily social, but exerting great influence on the policy of the larger organizations. The National Academy performs valuable functions as a select association composed of some of our more eminent scientific men, and the Society of Naturalists, composed of some of our more efficient and public-spirited students of the natural sciences in the eastern states can accomplish much, in the future as in the past, for the advancement of science.

J. MCKEEN CATTELL.
COLUMBIA UNIVERSITY.

THE ASTRONOMICAL AND ASTROPHYSICAL SOCIETY OF AMERICA.

I.

THE first winter meeting of this Society was held at the Cosmos Club, Washington, D. C., Monday, Tuesday and Wednesday of Convocation Week. Sessions for the reading of papers were held both morning and afternoon, on Monday and Tuesday, and on Wednesday morning. The maximum attendance of about fifty was reached on Tuesday.

Twenty-eight new members were elected, and it was decided to hold the next meeting of the Society at Washington during Convocation Week, 1902–3.

A number of the members lunched together both on Monday and Tuesday at Barton's, and on Monday evening attended a dinner at the same place. The president of the Society presided, and among the most delightful features were the after-dinner speeches of Professor W. W. Campbell, Professor George E. Hale and Professor S. I. Bailey. If a similar function is held at the next meeting it is hoped that the ladies of the Society will more generally follow the example of the two present at this time.

On Tuesday evening President and Mrs. Newcomb received the members of the Society and numerous invited guests at a conversazione held at the Arlington Hotel. During the evening papers illustrated by stereopticon were read by Mr. Percival Lowell on Mars, by Professor S. P. Langley on personal equation and the infra-red spectrum, by Professor George E. Hale on a comparison of the results obtained by photography from the forty-inch refractor and the two-foot reflector of the Yerkes Observatory, and by Professor W. W. Campbell on the work of the Lick Observatory eclipse party in Sumatra and the nebula surrounding Nova Persei.

After the reading of these papers the guests were invited into an adjoining room to partake of still another astronomical treat and refreshments. Here the room was fitted up with numerous transparencies and photographs from the Harvard College Observatory, from the Yerkes Observatory, from the Lick Observatory and from the United States Naval Observatory.

On Tuesday a number of the members visited the Astrophysical Observatory of the Smithsonian Institution upon a special invitation to the Society from Secretary Langley.

At the adjournment of the Wednesday morning session the members formed in line, marched to the White House and paid their respects to President Roosevelt, special arrangements having been made for their reception.

OFFICERS ELECTED.

For 1902: *President*, Simon Newcomb; *1st Vice-President*, George E. Hale; *2d Vice-Presi-*

dent, W. W. Campbell; *Treasurer*, C. L. Doolittle.

For 1902–3: *Councilor*, E. C. Pickering; *Councilor*, R. S. Woodward.

Holdovers: *Secretary*, George C. Comstock; *Councilor*, S. J. Brown; *Councilor*, Ormond Stone.

RESOLUTIONS ADOPTED.

Resolved, That the members of the Astronomical and Astrophysical Society in attendance at this meeting hereby tender their cordial thanks to the Board of Management of and to the members of the Cosmos Club for the use of the Club, Assembly and Council rooms, for the excellent facilities afforded for the illustration and exposition of the papers presented at this meeting, and for the kindly social courtesies extended to all members of our Society.

Resolved, That the thanks of this Society be tendered to Professor S. P. Langley for the special opportunity afforded by him to visit the Astrophysical Observatory of the Smithsonian Institution.

Resolved, That the thanks of the Astronomical and Astrophysical Society be tendered to the Philosophical Society and to its treasurer, Mr. Bernard R. Green, for the use of apparatus and courtesies shown during the present meeting of the Astronomical and Astrophysical Society.

Resolved, That the Secretary of the Society be requested to transmit the substance of these resolutions to the Board of Management of the Cosmos Club, to Professor S. P. Langley and to the officers of the Philosophical Society respectively.

Resolved, That the members of the Society in attendance hereby express their cordial appreciation of the active services of the President in perfecting all arrangements for this meeting and in providing so amply for social as well as for astronomical and astrophysical entertainment.

PAPERS PRESENTED.

1. 'The Flash Spectrum, May 18, 1901': S. A. Mitchell. [Read by J. K. Rees.]

2. 'Lick Observatory-Crocker Expedition to Sumatra to observe the Total Solar Eclipse of May, 1901': C. D. Perrine. [Read by W. W. Campbell.]

3. 'U. S. Naval Observatory Eclipse Expedition to Sumatra': A. N. Skinner.

4. 'Astronomical Photography with the Forty-inch Refractor and the Two-foot Reflector of the Yerkes Observatory': G. W. Ritchey. [Read by G. E. Hale.]

5. 'On the Phenomenon called Signals from Mars': Percival Lowell.

6. 'Preliminary Statement of Results of International Magnetic Observations during the Total Solar Eclipse, May, 1901': L. A. Bauer.

7. 'Meridian Circle Positions of Nova Persei': R. H. Tucker. [Read by W. W. Campbell.]

8. 'Note on the Parallax of Nova Persei': F. L. Chase.

9. 'Note on the Parallax of Nova Persei': R. G. Aitkin. [Read by W. W. Campbell.]

10. 'The Energy of Condensation of Stellar Bodies': R. S. Woodward.

11. 'Optical Distortion of Photographic Telescopes': Harold Jacoby.

12. 'The Constant of Aberration': C. L. Doolittle.

13. 'The Period of Delta Equulei': W. J. Hussey. [Read by W. W. Campbell.]

14. 'Duration of Twilight at Different Altitudes within the Tropics': S. I. Bailey.

15. 'The Determination of Double Star Orbits': George C. Comstock.

16. 'A Cosmic Cycle': F. W. Very.

17. 'A Comparison of Printing and Recording Chronographs': C. S. Howe.

18. 'The Clock Room at Case Observatory': C. S. Howe.

19. 'The Almucanter as an Instrument for the Determination of Time': C. S. Howe.

20. 'A Description of the Second (Chile) Mills Spectrograph': W. W. Campbell.

21. 'The Capture of Comets by Jupiter': Percival Lowell.

22. 'The Latitude-Variation Observatory of the International Geodetic Association': H. S. Davis.

23. 'Some Vices and Devices in Astronomical Computations': H. S. Davis.

24. 'On the Pressure of Light and Heat Radiation': E. F. Nichols.

25. 'The Mass of Titan and its Perturbations of Hyperion': W. S. Eichelberger.

26. 'Observations of November Meteors': C. A. Post and J. K. Rees.

27. 'A Kinematic Study of Hansen's Ideal Coordinates': K. Laves. (Read by title only.)

28. 'The Computation of Laplace's Coefficients by means of Gylden's γ Coefficients': K. Laves. (Read by title only.)

29. 'A Theorem Concerning the Method of Least Squares': Harold Jacoby. (Read by title only.)

30. 'The Nebula about Nova Persei': F. W. Very.

31. 'A Short and General Method of Determining Orbits from Three Observations': A. O. LEUSCHNER. [Read by O. Stone.]

32. 'Elements of Asteroid 1900 G A and Ephemeris for the Opposition of 1901-1902': A. O. LEUSCHNER and ADELAIDE M. HOBE. [Read by O. Stone.]

33. 'Discovery of Rapid Motion in the Faint Nebula Surrounding Nova Persei': C. D. PERRINE. [Read by W. W. Campbell.]

34. 'A Determination of the Wave Lengths of the More Prominent Nebular Lines': W. H. WRIGHT. [Read by W. W. Campbell.]

35. 'The Bruce Spectrograph of the Yerkes Observatory': E. B. FROST. [Read by G. E. Hale.]

36. 'A Remarkable Solar Disturbance': GEORGE E. HALE.

37. 'A Determination of the Cause of the Discrepancy between Measures of Spectrograms made with Violet to Left and Violet to Right': H. M. REESE. [Read by W. W. Campbell.]

38. 'Four New Spectroscopic Binaries with Notes on the General Subject': W. W. CAMPBELL.

39. 'Discovery of 500 Close Double Stars': W. J. HUSSEY. [Read by W. W. Campbell.]

40. 'Discovery of 300 New Double Stars': R. G. AITKIN. [Read by W. W. Campbell.]

ABSTRACTS OF PAPERS.

The Flash Spectrum, Sumatra Eclipse, May 18, 1901: S. A. MITCHELL.

The writer, through the courtesy of the director of the Naval Observatory, became a member of the expedition to view the Sumatra eclipse on May 18, 1901, and was stationed at Sawah Loento. Two instruments were employed, a camera of 104 inches focus to be used in connection with a cœlostat; and a spectroscope consisting of a Rowland flat grating of 15,000 lines having a ruled space of $3\frac{1}{2} \times 5$ inches, and a quartz lens of 3 23/64 inches aperture and 72 inches focal length. Light from the sun reflected by the cœlostat mirror in a horizontal direction, fell on the grating where it was diffracted, and was brought to a focus on the photographic plate by means of the quartz lens. If grating and photographic plate are each perpendicular to the diffracted beam, the spectrum is 'normal.' It was arranged to photograph the first order spectrum from λ 3,000 to λ 6,000.

The weather on the day of the eclipse was extremely disappointing. First contact was observed in a perfectly clear sky, but clouds soon began to gather and were so dense at second contact that the first flash was not observed at all. Toward the middle of totality conditions became a trifle better, so that it was possible to see, through clouds, the corona extending for about half a diameter from the sun. During no time of the 5 min. 41 sec. of totality was an unclouded view of the corona obtained, but nevertheless, the second flash was seen beautifully. Altogether eight exposures were made, one before and one just after totality for the cusp spectrum, one at first and one at second flash, and four with different lengths of exposure during the total phase. The second flash seemed fully exposed, and it is to a discussion of this photograph that this paper is devoted.

The peculiarities of this photograph are:

1. Normal spectrum.
2. Great dispersion.

On the plate the distance from F to H is 95.4 mm., and as the spectrum is normal, 1 mm., therefore, corresponds to a difference of wave-length of 9.37 tenth-meters, or 1 tenth-meter corresponds to a dispersion of about 0.1 mm. For some reason, the spectra were not in perfect focus, but in spite of this fact, in view of the great dispersion of the spectrum, measures were made and wave-lengths determined with a high degree of accuracy. The spectrum extends from λ 4,924 to λ 3,320, but the focus becomes poor beyond K, and measures were discontinued at λ 3,835. For the purposes of the present comparison, the region from F to H only was regarded. In this part of the spectrum 363 lines were measured in the flash. An arbitrary scale of intensities was assumed whereby 0 represents the faintest line seen with certainty,

10 the strongest line. Wave-lengths were compared with Rowland's measures of the solar spectrum. Of the 363 flash lines, 269 were identified with lines on Rowland's map. Although we cannot directly compare the intensities of the bright lines of the flash (scale 0–10), with those of the dark lines given in Rowland's tables (scale 1–1,000), we can arrive at certain theoretical considerations if we compare the average intensities for the different elements, *i. e.*, $\frac{\text{Flash intensities}}{\text{Solar intensities}}$, and also the ratios of the number of lines of each element identified to the whole number of solar lines for that metal. Forming these ratios and arranging them, we are at once struck with the systematic variations, not only in the ratio of intensities, but also in the per cent. of lines identified. The meaning of these systematic differences will be understood if we consider these ratios in combination with the atomic weights of the various elements, as in the following table, where also is put down the number of the lines in the flash due to each metal.

These lines naturally fall into three groups, as given in the table below.

To these may also be added the following lines:

La,	atomic weight,	138.5	.....3 lines
Ba,	" "	137	.....1 line
Ln,	" "	65	.....1 line

In Group I. would also fall Al if we consider the relative intensities of the two lines λ 3,944.160 and λ 3,961.674; and undoubtedly Na if our plate took in the D lines. The remarkable variation of the relative intensities in the flash and Fraunhofer spectra, as Evershed has pointed out, is undoubtedly due to the *heights* to which the vapors of the different metals ascend in the chromosphere. A gas with an intrinsic brightness 1 and a layer 100 miles in thickness, would give a photographic line in the flash spectrum just as bright as a gas of intrinsic brightness 100 and only 1 mile

Group I.—Lines Strong in Flash and in Solar Spectrum.

Element.	Atomic Weight.	Number of Lines.	Intensity Flash. / Intensity Solar Lines.	Lines Identified. / Total Number of Lines.
Na	23.0			
Mg	24.3	1	0.10	1.00
Al	27.1			
Ca	40.0	8	0.34	0.38

Group II.—Lines Strong in Flash, Weak in Solar Spectrum.

Element.	Atomic Weight.	Number of Lines.	Intensity Flash. / Intensity Solar Lines.	Lines Identified. / Total Number of Lines.
Sc	44.1	6	0.86	0.75
Ti	48.1	62	0.67	0.70
V	51.2	15	0.49	0.68
Cr	52.1	38	0.56	0.64
Mn	55.1	27	0.25	0.48
Sr	87.6	2	1.08	0.67
Y	88.7	2	0.50	0.67
Zr	90.6	8	0.27	0.62

Group III.—Lines Weak in Flash, Strong in Solar Spectrum.

Element.	Atomic Weight.	Number of Lines.	Intensity Flash. / Intensity Solar Lines.	Lines Identified. / Total Number of Lines.
Fe	56.0	125	0.23	0.32
Ni	58.7	9	0.32	0.28
Co	59.0	6	0.19	0.29

thick, if the sun and moon were relatively at rest during the period of the 'flash'; but considering the gradual advance of the moon in covering successive layers of the sun's atmosphere, we see that in the emission spectrum the flash line of the fainter gas would be many times more intense than that of the brighter. The absorption lines of the two gases would be very nearly the same. The extent of the metallic vapors of the sun's surface probably varies inversely proportional to their atomic weights.

In consideration of these facts, it seems altogether likely that the gases of the metals of Group II. extend very high, and are nowhere very much condensed. The flash lines are to be regarded as true reversals of the corresponding solar lines. The metals of Groups I. and III. are somewhat denser near the sun's surface and do not extend so high as those of Group II., but as it is the upper portions that contribute most to the formation of the emission lines, the flash lines are to be regarded as only partial reversals of the Fraunhofer lines, the solar intensities being greater than the flash intensities. Most of the strongest lines in the solar spectrum have been found in the flash; and this, taken in connection with the meaning of the differences of intensities, leads us to further renew our faith in the existence of the 'reversing layer.'

The Total Solar Eclipse of May 18, 1901: C. D. PERRINE.

The expenses of an expedition to Padang, Sumatra, from the Lick Observatory, to secure observations of this eclipse, were defrayed by Mr. William H. Crocker, of San Francisco. Eclipse day dawned with light clouds covering the sky. But little change occurred during the morning. At the time of first contact, the sun shone through a rift in the clouds. At the beginning of totality all parts of the sky near the sun were covered with light cirrus clouds and haze. The inner corona only and Mercury and Venus could be seen during the early part of totality. The clouds became very much heavier towards the end of totality. The time of beginning and ending of totality was 3 or 4 seconds later than the time of these phases computed from data given in the *American Ephemeris,* but the uncertainty of longitudes in Sumatra may account for nearly if not all of this. Twelve photographs of varying exposures were secured with a camera of 40 feet focal length. These show the inner corona and prominences as well, probably, as if the sky had been free from clouds. The longest exposure, one of 150 seconds, shows the streamers to a distance of one and one-third diameters from the limb—more than could be seen with the unaided eye. A number of small prominences are visible on the east limb of the sun. One of these at position-angle 115° is covered with a series of coronal hoods or envelopes. Attention is called to a remarkable disturbance in the corona in the northeast quadrant. At a position-angle of about 65° there is a small compact prominence, over which there is a disturbed area resembling roughly an inverted cone. From the apparent apex of this area a number of irregular streamers and masses of matter radiate as if thrown out by an explosion. I am not aware that a disturbance of this kind has been observed before in the corona proper. Eight photographs were secured with the Floyd telescope of 70 inches focal length. These negatives show the same extensions of corona as those taken with the 40-foot camera. Twelve negatives were secured of six regions on either side of the sun in the direction of his equator for the purpose of detecting any planets existing there. These negatives were obtained with lenses of 3 inches aperture and 11 feet 4

inches focal length.* A preliminary examination of these negatives was made at the station and 92 stars of magnitude 8.6 to 8.8 were found in three of the regions. The plates taken during the latter part of totality show no star images, owing to the increased cloudiness. A negative with long exposure was secured with each of two spectrographs, one having the slit tangential, the other radial. The principal Fraunhofer lines are shown in the outer corona in both, none, however, being observable in the extreme inner corona. Ten negatives were secured with a camera of 21 inches focal length, having a double-image prism placed in front of the objective. The two images given by such a prism and camera furnish a means of detecting by differential methods any considerable polarization in the corona. The axis of the prism was set at several different position angles between the sun's equator and his poles. In this way all parts of the corona were tested. The negatives secured show a large percentage of polarization in the outer corona and a slight amount in the inner corona. The two spectrographs and the polarigraph were designed and prepared for use by Director Campbell and Assistant Astronomer W. H. Wright. The great southern comet was a conspicuous object in the evening sky for several days and was visible without aid for more than a week. Photographs of it with a portrait lens were secured on May 6. The exposures were necessarily short, but show 3° or 4° tail. A faint streamer is also shown to the south, making an angle of about 35° with the principal tail. A number of large copies, on glass, of the eclipse photographs, as well as lantern slides, were shown at the meeting.

* Two of the four lenses used in Sumatra were kindly loaned for the purpose by Professor E. C. Pickering, Director of the Harvard College Observatory.

A Martian Cloud: Percival Lowell.

This paper gave an account of two projections seen upon the terminator of Mars by Mr. A. E. Douglass at the Lowell Observatory on December 7 and 8, 1900; the observations which gave rise to the popular impression last year of signals from Mars. Calculation showed them to belong to different parts of the planet and to have moved during the time they were under observation. Furthermore, the motion in each case was approximately the same—nearly due west in each case. Neither of them reappeared on any succeeding night. They thus showed themselves to be not illuminated mountain tops, but sunset clouds floating in the planet's atmosphere.

Preliminary Statement of Results of International Magnetic Observations made during the Total Solar Eclipse of May 17–18, 1901: L. A. Bauer.

To further test the results obtained by the United States Coast and Geodetic Survey magnetic parties during the total solar eclipse of May 28, 1900, regarding a slight magnetic effect that may be attributable directly to some change produced in the electrification of the upper atmospheric strata by the abstraction of the sun's rays, due to the interposition of the moon between the sun and the earth, an appeal was made for international cooperation in magnetic and allied observations during the recent total solar eclipse. The repetition of the observations was doubly interesting owing to the fact that the present eclipse occurred in the opposite magnetic hemisphere to that of last year, and hence the opportunity was afforded for ascertaining whether the magnetic effect was reversed in its general character to that of last year, as is, for example, the case with the diurnal variation in passing from one magnetic hemisphere to the other. The conditions, however, for obtaining observa-

tions at a number of stations distributed along the belt of totality, as was done last year, and thus testing whether the magnetic effect again followed directly in the wake of the shadow cone, were not favorable owing to the present location of the belt of totality. In response to the appeal, simultaneous magnetic observations were made on May 17 from 14 to 21 o'clock, Greenwich mean astronomical time—an interval amply covering the time of the eclipse—at a number of stations encircling the entire globe, three of which were in the belt of totality. The prime purpose of making the observations so as to cover the entire globe was to furnish the possibility of separating a possible eclipse magnetic effect from a contemporaneous magnetic storm of the usual type. The eclipse effect, for instance, doubtless would be confined to a very small belt, whereas a customary magnetic storm, in conformity with the usual experience, would manifest itself at practically the same moment of time over a very large area, and thus be felt at stations far from the totality belt. At none of the outside stations has a disturbance of any appreciable size been thus far reported to me, the general consensus of opinion of observers at these stations being that 'nothing unusual occurred.' At the three stations within the belt of totality the majority of the opinions is that something unusual did occur during the time of the eclipse. Thus at Karang Sago, where was situated the Dutch eclipse party, Dr. W. van Bermelen, assistant director of the Batavia Magnetic Observatory, observed the change in the magnetic declination and horizontal intensity, and he reports the occurrence of 'an extremely interesting magnetic effect.' He has courteously sent me an extract of his observations made during several days before and on the day of the eclipse, and there certainly appears evidence of a magnetic effect in both elements different from that observed on the days prior to the eclipse. At Sawah Loento, the site of the Massachusetts Institute of Technology party, of Boston, the variations in magnetic declination were observed by Mr. G. L. Hosmer on May 17 and 18. Comparing the two days' results for the interval of the eclipse, there is indisputable proof that something different occurred on the day of the eclipse than on the day before. Namely, at this station, situated so close to the magnetic equator the range of the diurnal variation of the magnetic declination is about one minute of arc. The magnetic effect during the time of the eclipse was of about the same amount, so that a steady *decrease* of east declination resulted during the time of day when normally there is a steady *increase*. There was but one magnetic observatory directly within the belt, viz., the one at Mauritius and this was situated not far from the place of beginning of the eclipse. No special magnetic observations were made at this place; however, the regular photographic curves giving the variations in the magnetic elements were obtained. The declination and the vertical intensity curves apparently do not show any disturbance that could easily be picked out and referred to the eclipse. Regarding the horizontal intensity curve—the more sensitive one—Mr. Claxton states 'that the original curve shows slight tremors between 7.15 and 7.50 and occasionally between 8.5 and 9.0 A. M.' I have plotted this intensity curve on a large scale and find that the curve shows no very marked disturbance that might be readily referred to the eclipse, with the exception of one producing an easily perceptible bulge in the curve amounting to about 3–4 units in the fifth decimal c.g.s. units and lasting about 30 minutes. Anyway the effect, if there be one, is very minute, and will not be so readily separated from the usual diurnal variation as in the case of the two previous stations. Whether

this is due to the fact that owing to the vicinity of Mauritius to the beginning of the eclipse, the minute eclipse magnetic storm did not have time to develop itself or was just in the embryonic state, cannot be said. The magnetic effect observed at Karang Sago and at Sawah Loento does not appear to have extended very far outside of the belt of totality, it being scarcely appreciable at the Batavia Magnetic Observatory. My grateful and appreciative acknowledgments are due to all who have participated in this interesting investigation—one to my mind of fundamental importance to the theory of the diurnal variation of the earth's magnetism as elaborated by Schuster and von Bezold.

Meridian Circle Positions of Nova Persei: R. H. Tucker.

Meridian circle positions were obtained on eight evenings in February and March, and on four evenings in November. The difference in the right ascensions resulting from the two series of observations is 0.05 seconds. The star was more than four magnitudes brighter at the time of the first series than at the second. Making allowance for the magnetic equation, the difference between the right ascensions for the two series reduces to 0.01 seconds. The declinations in the two series differ by 0.05″. It is therefore evident that these observations indicate a very small parallax and proper motion. The large proper motion recently reported by a European astronomer is not confirmed.

On the Parallax of Nova Persei: F. L. Chase.

This paper was based upon observations made with the Yale heliometer, the first set in February and March, the second in July and August and a third in December. The result derived for the parallax confirmed the value found from the first two sets alone, in which the proper motion could not be taken into account, which value was published in a paper presented at the Denver meeting of the A. A. A. S. last August. This value was practically zero relative to the mean parallax of the two comparison stars employed, stars of about the eighth magnitude. In conclusion the author remarked that, considering its probable error, the value found was not incompatible with that required by the hypothesis advanced by Wolf and others, viz., that the apparent displacements in the nebula surrounding the Nova represent a velocity corresponding with that of an electric wave.

Note on the Parallax of Nova Persei: R. G. Aitken.

An attempt was made to determine the parallax of Nova Persei from the micrometric measures of six faint stars near it. The first set of measures was obtained, under very unfavorable conditions, shortly after the appearance of the Nova, and a second set on two nights in the latter part of July. The resulting values of the relative parallax were all negative, so that no conclusion can be drawn, unless, possibly, that the parallax of Nova Persei is very small. No account was or could be taken of possible proper motion.

The Energy of Condensation of Stellar Bodies: By R. S. Woodward.

This paper considers the density, pressure and energy of condensation from a state of infinite diffusion, of a spherical stellar body in which Laplace's law of density holds. Denoting the potential, density, and pressure at a distance r from the center of such a mass by V, ρ and p, respectively, the problem is stated in three equations, namely:

$$\frac{\delta^2(rV)}{\delta r^2} + 4\pi k r\rho = 0,$$

$$dp = c\rho d\rho = \rho dV,$$

wherein k is the gravitation constant and

c is the constant connecting density and pressure in Laplace's celebrated hypothesis. Assuming the density to vanish at a distance r_0 from the center of such a body, it turns out that V, ρ and p are given by the following formulas, in which ρ_c and p_c are the central density and pressure, respectively, and M is the mass of the star:

$$a = \pi/r_0, \qquad q = \sin ar/(ar),$$

$$\rho_c = M\pi/(4r_0^3), \qquad p_c = M^2k\pi/(8r_0^4),$$

$$V = \frac{Mk}{r_0}(1+q), \quad \rho = \rho_c q, \quad p = p_c q^2.$$

The energy of condensation of such a mass is found to be

$$\tfrac{3}{4}\frac{m^2k}{r_0} = \tfrac{3}{4}Fr_0,$$

where F is the force of attraction between M and an equal mass of infinitesimal volume situated at a distance r_0 from the center of M. It will be observed that the results here given require no hypothesis as to the temperature of such bodies.

Optical Distortion of Photographic Telescopes: HAROLD JACOBY.

The observations discussed in the present paper form part of a more extended series undertaken in the year 1895, having for its principal object a study of the optical distortion of astronomical photographic objectives. A question had been raised as to the fidelity with which photographic telescopes reproduce upon the negative exact relative positions of the stars as they appear on the sky. This matter is fundamental to the art of astronomical photography throughout the entire range of its more important applications to stellar parallax, interstellar motion within the close clusters, and star charting in general; so that the large amount of labor involved even in its partial elucidation does not appear to be superfluous. Valuable cooperation in the work has been granted with ready kindness by several astronomers; and with their aid the special problem under investigation has been solved in a fairly satisfactory manner.

This special problem may be thus stated: Is the scale-value of an astronomical photograph absolutely independent of the direction of measurement on the negative? In other words, if we determine the coordinates of star-images on the plate in millimeters with reference to a pair of rectangular axes, the question is: Will a distance of one millimeter measured from the center of the plate along the X-axis correspond to precisely the same number of seconds of arc on the sky as a distance of one millimeter measured from the same center along the Y-axis? The matter may be put in still another way. Suppose there were upon the sky a number of stars so situated as to form a small but perfectly exact circle. Would a photograph show these stars situated upon a similar exact circle on the negative, or would defects of the object glass distort their position into an ellipse-like oval, after the manner of atmospheric refraction? If this is the case, equal diameters of the circle on the sky will become unequal diameters of the oval on the plate; and, in general, equal distances upon the sky expressed in seconds of arc will become unequal distances upon the plate expressed in millimeters, even after correction for all known sources of difference, such as refraction, aberration, etc.

Various investigations of optical distortion have been published by Donner, Turner and others; but they were all made by methods necessitating a knowledge of relative star positions based on measures other than photographic. To avoid this inherent difficulty, the writer suggested in 1893 a process in which it is not essential to have a precise previous knowledge of relative star positions. It is thus rendered entirely unnecessary either to make a laborious and time-consuming heliometer trian-

gulation, or resort to comparatively inaccurate star-places, such as those obtained with meridian instruments. Proper motion, also, which necessitates new heliometric triangulations made very near the date of the photographic observations, is altogether eliminated in the use of this method.

It is merely necessary to arrange the telescope so that it can be rotated around its optical axis, or some other axis parallel to its optical axis. Suppose two photographs of a group of stars have been made with such a telescope, rotated 90° between the two exposures. If, then, the object glass possesses the peculiarity of making all the Y-coordinates too large in the first exposure, the same peculiarity will show itself in the second exposure by making all the X-coordinates correspondingly too large. Thus it is sufficient to make a series of negatives of the same star-group, rotating the instrument through various angles between the exposures, when a simple comparison will surely bring to light any form of optical distortion depending on the direction of measurement upon the plate.

The process is a purely differential one, and requires only a roughly approximate knowledge of the absolute star-positions, sufficient for the computation of refraction corrections, etc. It can be applied to an equatorial telescope of the ordinary form if we photograph the region immediately surrounding the pole of the heavens. In that case, the polar axis of the equatorial becomes a suitable axis for rotating the telescope, since the polar axis is parallel to the optical axis, when the tube is pointed at the pole. It is obvious that a trial of this method will furnish not only a determination of optical distortion, but will yield also, as a sort of by-product, a photographic catalogue of the close polar stars. For this reason it seemed desirable to include in the work a set of plates of the south pole as well as the north. In this way we should obtain very precise catalogues of both sets of close polar stars, all reduced and computed according to a uniform method.

In 1895 the writer was visting at the Cape of Good Hope Observatory, and discussed the matter with Sir David Gill. The plan met with his approval, and he consented gladly to make the necessary south polar plates. With equal readiness, Dr. Anders Donner, of the Helsingfors Observatory, offered to make the north polar plates. These latter negatives were measured at Columbia University by Mrs. Herman S. Davis and Mrs. Annie Maclear Jacoby; the measures were reduced at Vassar College by Miss C. E. Furness; and they were published by the Vassar College Observatory. The south polar plates were similarly measured and reduced at Columbia by Misses F. E. Harpham, Mary Tarbox, Eudora Magill and H. L. Davis, and the results will soon be published by the Observatory of Columbia University. The researches for both poles agree in showing that the optical distortion depending on direction of measurement is too small to be detected with certainty even by the delicate differential method here described.

W. S. Eichelberger,
For the Council.

(To be concluded.)

THE U. S. COAST AND GEODETIC SURVEY.

The last annual report* of the Superintendent of the United States Coast and Geodetic Survey to Congress is fully illustrated with maps and diagrams and presents in detail the work accomplished by this bureau for the fiscal year ending June 30, 1901.

Throughout the report there is frequent evidence of the increased scope of the Survey's operations within the last few years, as well as proof of the flexibility of the

* Now in the hands of the printer.

organization, which appears to have readily adapted its methods to the diverse conditions of our widely distributed possessions.

Appendix 4 in a manner indicates the continuous growth of the area to be charted by the Survey, which has followed upon the territorial expansion of our country. It consists of tables used in the computation of geographical positions. The first publication of this character was limited to the United States, between 23° and 50° of latitude. Two extensions carried the tables to the Arctic Ocean and the present one extends them to the equator.

The physical and social conditions of Alaska and of the Philippines make a strong contrast, and the methods employed in charting the two regions must on that account, to a certain extent, differ. But it appears from the report that there are other conditions common to both which require similar treatment. It is the general belief that both Alaska and the Philippine Islands are on the threshold of a commercial awakening. The rich mineral resources of the former promise steady development, while the many valuable products of the latter only await organized effort to be the source of a boundless traffic. For the safety of the vessels and cargoes engaged in this commerce accurate charts are most important. Those of a large portion of the coast of Alaska and adjacent waters are still constructed from the information obtained by early explorers and navigators, whose facilities for obtaining accurate locations were meager. In the Philippines the charts are truly oriental in their untruthfulness.

It is the policy of the Survey to first attack those portions most urgently needed and the doubtful areas in Alaska are being gradually reduced in size. Thus during the year surveys were extended along the coast of Seward Peninsula where Nome, the focus of the latest and most promising gold fields, is situated. It faces the open sea and at present the transfer of persons and property to and from the vessels is subject to the risks of sudden storms and heavy surf. In the future development of this region a harbor for ocean-going vessels will be a necessity, and with this in view the two nearest, Port Clarence to the north and Golofnin Bay to the east, were included in the Survey. Later in the year the principal passes through the Aleutian Islands into Bering Sea, as well as Icy Straits and Cross Sound, were taken up with every prospect of completion.

In the Philippines, Manila, as the seat of the government, is the central point from which the telegraph lines diverge in all directions. A suboffice and astronomical station were established there, and from the latter as the initial point the longitudes of 14 stations were determined by telegraph and also at the same time latitude and azimuth observations were made. Three charts and notices to mariners were issued and six additional charts were ready for publication on July 1. A steamer was purchased by the Philippine Commission for the use of the Coast and Geodetic Survey, and money was appropriated by the Commission to repair and equip this vessel.

In Porto Rico, hydrographic work was continued in the harbors and bays and offshore. The triangulation around the island and topographic surveys of the shore line were continued. The topographic survey of Vieques Island was completed.

Our home interests were not neglected as may be seen from the fact that hydrographic and topographic surveys were made in localities in 19 States for the purpose of bringing the charts up to date in consequence of natural or artificial changes which have occurred since the original surveys.

Speed trial courses for the use of ships and torpedo boats were established in Dela-

ware and Chesapeake bays, and the Santa Barbara channel course was extended.

In addition to other field and office work, continuous tidal stations were maintained in this country at 6 stations and at 1 in the Philippines, and tide tables for 1902 were published, giving predictions for 70 principal and about 3,000 subordinate stations throughout the world.

During the year the Coast Pilot relating to southeast Alaska was thoroughly revised in the field and prepared for the printer. The field revision of the Coast Pilot between San Diego and San Francisco was completed and new editions of sections relating to the Atlantic coast were published, and the revision and issue of other numbers are in progress.

Strict business methods are not often associated with the measurement of the bases of a great trigonometrical survey. From the literature on the subject it appears that in the endeavor to attain a high degree of accuracy financial considerations have been subordinated to the scientific and experimental. The conduct of the measure of the nine bases along the ninety-eighth meridian was an exception to this rule, and Appendix No. 3, which describes the methods and results has an added interest of novelty. This was the first campaign of a party organized solely for the measurement of bases. A great gain in economy and time was accomplished by taking advantage of the skill acquired by the party by the frequent repetition of the same operations. After a thorough study of former measures a standard of accuracy was determined upon, and the operations so planned, by strengthening some points in the methods, that the number of measures could be reduced and certain refinements omitted. These bases form part of the chain of triangulation which it is proposed to extend along the ninety-eighth meridian, in both a north and south direction from the transcontinental chain, to the boundaries of the United States. It will include an arc of 23°, and together with the transcontinental triangulation as the backbone will form one of the ribs of the main framework for the control of all the triangulation in the United States. The Mexican Government has already in progress a system along the same meridian which, it is expected, will extend the arc 9° in latitude, and it is also possible for the Canadian Government to extend the arc far to the northward. Appendix No. 6 treats of the completed portion of the work in Kansas and Nebraska.

In connection with the general magnetic survey which supplies the data for constructing the compass diagrams on the charts, and furnishes the land surveyor the information for correctly running his traverse lines, observations were made at 374 stations in 30 States and Territories, including Alaska, Porto Rico, Hawaii and the Philippine Islands. In southeastern Alaska places have been examined where local magnetic disturbances affect the compasses of passing ships to such an extent as to endanger navigation.

A magnetic observatory has been established in Maryland, and sites for others have been selected in Alaska and Hawaii. In addition to their regular work, these will cooperate, at the formal request of the German Government, with the international magnetic work to be carried out during the time of the various antarctic expeditions which have been sent out from Germany and Great Britain.

Another piece of work of international interest was executed by the Survey in 1900. Observations were then made with the half second pendulum apparatus, devised by the Survey, at several of the more important European base stations, for the purpose of connecting Washington, which is used as the base for the American pendu-

lum observations. Appendix No. 5 gives the details of the results secured.

A special report on 'The Eastern Oblique Arc of the United States was completed and is being printed as a special publication. It is an important contribution to the subject of geodesy.

Satisfactory results have been obtained at the astronomical observatories maintained under the direction of the Survey at international expense, at Gaithersburg, Md., and Ukiah, Cal., for the purpose of determining the variation of latitude.

The Survey has been represented by its officers on commissions charged with the marking of one international and two state boundaries.

The report refers to the reorganization of the Office of Standard Weights and Measures and its establishment as the National Bureau of Standards by act of Congress March 3, 1901. The principal reasons for the change in order to meet the present requirements of scientific and commercial interests are summarized, and a description of the functions of the new bureau and the proposed buildings and accessories is given in detail.

SCIENTIFIC BOOKS.

A Treatise on Zoology. Edited by E. RAY LANKESTER. Part IV. *The Platyhelmia, Mesozoa, and Nemertini.* By W. BLAXLAND BENHAM, D.Sc., M.A. London, Adam and Charles Black, Publishers; New York, Macmillan & Company. Pp. 204. 114 figs. in text. Price $5.25.

Volume IV. of Lankester's valuable series well maintains the standard set by the parts previously issued, and the lower divisions of the old group 'Vermes' are here treated in a broad and suggestive manner by a well-known helminthologist. The author deserves the gratitude of all zoologists for bringing together in a concise but comprehensive form the many facts that have been accumulated in connection with these lower forms of Invertebrata.

From the nature of the subjects treated the text is necessarily disconnected, but each division is accurately set forth in respect of the structural modifications and types, and each is complete in itself. The divisions which are thus separately treated are: Turbellaria, Temnocephaloidea, Trematoda, Cestoidea, Nemertini, and appendices to the Platyhelmia, including Rhombozoa (*Dicyema*, etc.), Orthonectida, Trichoplax, Salinella, etc. The author adopts Lang's classification of the Turbellaria into Rhabdocœlida, Tricladida and Polycladida; Monticelli's orders of the Trematoda, and Bürger's divisions of the Nemertini. The greatest changes are to be found in the Cestoidea. Here Lang's 'orders' *Cestoda monozoa* and *Cestoda polyzoa* are changed to the 'grades' *Cestoda monozoa* and *Cestoda merozoa*, while each is further divided into sections and orders. Among the *monozoa* we find the orders *Amphilinacea, Gyrodactylacea* and *Caryophyllacea* based upon the characters of the genera similarly named. The *merozoa* are further subdivided into sections *Dibothridiata* and *Tetrabothridiata* according to the number of sucking cups or 'bothria.' In the former there is one order, *Pseudophyllidia* of van Beneden, while in the latter the number of orders is raised to four: *Tetraphyllidia, Diphyllidia, Tetrarhyncha* of van Beneden and *Tetracotylea* of Diesing. (Tæniidæ auct.)

We are particularly pleased with the substitution of the term 'merozoa' for Polyzoa in the classification of Cestoidea and it should do away with the confusion of terms among English-speaking zoologists who adhere to Thompson's term Polyzoa for an order of the Molluscoida. The use of the term 'Mesozoa' in the title of the book is less satisfactory for it perpetuates the probable error of regarding a small group of parasitic and degenerate forms of Platyhelmia (?) as 'intermediate' or primitive types, notwithstanding that this view is strongly attacked in the text, where the word appears only in an historical sense.

An innovation of great value is the introduction of a concise historical statement, in which are given the names and dates of the men who have added to our knowledge of each of the classes considered; and still another

feature which adds interest and value to the book, is the frequent allusion to general zoological theories. For example, the relations of the Nemertini to the theories of the origin of metamerism are considered in sufficient detail to make the matter clear. On this particular question the author takes no positive stand one way or the other, but is inclined, on the whole, to follow Hatschek and Mayer. These additions greatly enhance the general interest of technical works like the one under consideration and materially lessen the burden of the load of detail which the student must struggle under.

The style of writing, although somewhat heavy, is clear and definite, and awkward phrases like 'a pair of groups,' and 'than which,' or careless statements, such as 'the very close relationship of these two groups (Turbellaria and Nudibranch molluscs) with the Cœlenterata' (p. 12), are rarely encountered. The author puts himself in the way of a great temptation by describing at the outset what he considers to be an 'ideal' Platyhelminth, and throughout the book we find him, consciously or unconsciously, setting up this ideal as a phylogenetic fetish. Such a method of presentation may or may not be subject to criticism, according as the book is to be used as a text-book or as a reference book. The 'type' method is very handy for teaching purposes, but as a basis for phylogenetic deductions it appears somewhat out of place and becomes a source of possible error. These are but minor criticisms, however, and may be easily overlooked when we consider the many merits and interesting suggestions which the author has embodied in this volume.

Gary N. Calkins.

Columbia University.

Yale Bi-Centennial Publications. Contributions to Mineralogy and Petrography from the Laboratories of the Sheffield Scientific School of Yale University: Edited by S. L. Penfield and L. V. Pirsson. 1901. With three plates and several figures.

The volume comprises 'a series of reprints from some of the most important of the papers containing the results of the researches made in the chemical, mineralogical and petrographical laboratories at Yale in the lines of mineralogy and petrography.' Part I. by Professor Penfield includes a history of the mineralogical department and of the development of mineralogy at Yale, which goes back to the first years of the last century and continues since then to represent American mineralogical research. A bibliography of mineralogical papers and summary of new mineral species determined, or of formulas established, is added. Forty-three papers on mineralogical subjects are reprinted, mainly from the *American Journal of Science* between 1850 and 1901; the authors are S. L. Penfield, Geo. J. Brush, E. S. Dana, H. L. Wells and others. Part II. by Professor Pirsson gives a similar history and bibliography for the petrographical department, which, notwithstanding its comparatively recent organization, makes a valiant exhibit even compared with its older companion. Eight petrographic papers, several of classic interest to American petrographers, are reprinted. The volume is a valuable collection of important papers, and a striking record of original research in the departments included.

John E. Wolff.

Harvard University.

Velocity Diagrams. By Chas. W. MacCord, A.M., Sc.D. New York, J. Wiley & Sons; London, Chapman & Hall. 1901. 8vo. Pp. 113. Figs. 83. $1.50.

Professor MacCord has published in this form an abstract of lectures forming a part of his course of instruction, illustrating his methods of treatment of problems in kinematics involving the construction of 'velocity diagrams' and supplementing the work embodied in his larger treatise on 'Kinematics of Practical Mechanism.' He has, for many years, found this class of graphical construction peculiarly interesting as bearing upon the work of the designing engineer planning combinations of mechanical movements, and he has developed this feature of his work with rare skill, ingenuity and practicality. The occasional appearance of an article by the same hand in the technical journals, notably in the *Scientific American Supplement,* has been al-

most the only evidence since the time of Willis that any master-hand has been working in this important field. The present publication places on record, in a convenient form, a considerable collection of such work and one likely to prove valuable to all mechanical engineers and draughtsmen.

The points here discussed and graphically treated are the general principles of the science, angular velocities, instantaneous axes, contact motions, including cams, rolling contacts, eccentric and related motions, linkwork, including 'slow advance and quick return' compositions, which are extensively treated, and, finally, the accelerative motions.

These discussions are concise, accurate, direct and clear. The theory of each case is developed as the construction progresses, in an admirable manner, and the graphical work is always equally clear, exact and legible. The author is an expert in this field and his skilful hand is recognized in the graphical constructions and their beautiful lines quite as well as in the text.

The book is printed on fine paper—which is, in fact, essential to the proper production of the illustrations—and the type and finish are alike appropriate to the artistic work of the writer of the treatise.

R. H. T.

GENERAL.

ON behalf of the Committee on Historical Documents of the American Historical Society, Supreme Court Justice Mitchell reported at the last meeting that arrangements had been made for the publication in full of the original journals of Lewis and Clark. These notebooks were deposited with the Society nearly a century ago by Governor Clark at the request of President Jefferson, under whose direction was sent out the expedition which gave the country the first knowledge of the newly acquired northwestern possessions.

THE Berlin and Copenhagen Academies of Sciences have commenced the task of collecting all the manuscript left by Galen and compiling a new and complete edition of his works.

THE preliminary work upon the preparation of a revised catalogue of the birds of Ohio has resulted in the addition of twenty species to the list since Dr. Wheaton's catalogue was published. Nearly 150 preliminary lists have been sent out for additions and corrections, but hardly a third of them have been returned to date. From those returned annotated much valuable information has been gained, particularly of an ecological nature, furnishing a basis for comparisons with conditions in Dr. Wheaton's time. Considerable field work must still be done in the extreme western, the eastern and the southern fifth of the State before the ideals upon which the work of revision was founded can be even approximately realized. As an aid to the furtherance of this work the compiler solicits information from all who are familiar with Ohio birds, who have not already examined a preliminary list. Communicate with Lynds Jones, Oberlin, Ohio.

SOCIETIES AND ACADEMIES.

BIOLOGICAL SOCIETY OF WASHINGTON.

THE 348th meeting was held on Saturday evening, January 25.

Under the heading of notes W. H. Dall called attention to the practice indulged in by some writers of rejecting names in biology which differ only by terminations indicating gender, as *Cyprina* from *Cyprinus*. He reprobated the practice as, if carried out strictly, likely to overthrow many names which have been in universal use for a century or so, and with absolutely no gain to science. As a particularly glaring instance of this he cited a recent experience with the work of Duméril, 'Zoologie Analytique,' issued in 1806. Duméril gave names to the animals of mollusca, distinct from those applied to the shells, by adding to the latter the termination *arius*. Thus we have the animal of the shell called *Nassa* by Lamarck, referred to a genus *Nassarius* by Duméril. On the ground that this name existed, though like all Duméril's names an absolute synonym, the later genus *Nassaria* of Adams and Reeve has been rejected by a recent writer. On looking up the facts in the

case and making a list of Duméril's names for future reference, it was found that among them was one called *Pleurotomarius,* founded on the animal of *Pleurotoma* Lamarck. This, if the above obnoxious custom were adopted, would oblige us to reject *Pleurotomaria* J. Sowerby, and its equivalent *Pleurotomarium* Blainville, for the well-known archaic genus of mollusks which has been accepted by everybody since 1821. The type of *Pleurotomarius* Duméril, furnished by Froriep in his translation of 1806, is *Pleurotoma babylonia* Lamarck, which is the type of Lamarck's genus *Pleurotoma,* 1799.

David Griffiths described, under the title 'A Seed Planter,' the peculiar method by which the seeds of *Plantago fastigata* are enabled to obtain a foothold on the baked plains of the southwest. The seeds of this plant are very abundant and are scattered far and wide, accumulating in every little depression. After the slightest shower these seeds are surrounded by a thick mucilaginous layer which, as it dries and shrinks, creates a minute pit under each seed, into which it sinks and is covered with dust and buried ready to germinate and send down a rootlet after the next shower.

F. A. Lucas presented 'A Phase of the Blue Fox Question,' referring to a paper read before the Society two years ago, in which he described the methods of trapping blue foxes devised by Mr. James Judge and employed on St. George Island of the Pribilof group. He recalled that males only were kept in the endeavor to make the foxes polygamous and his remark that the results of the experiment would be awaited with interest. The present communication gave the observations of Mr. Walter I. Lembkey, Treasury Agent, showing that after four years of trapping there was no evident increase either in the total number of foxes, or in the number of females. The entire paper will be given later in Science.

Rodney H. True discussed at some length 'The Physiology of Sea Water' and a synopsis of the paper will be found in the account of the meeting of the Society of Plant Morphology and Physiology given in Science.

F. A. Lucas.

National Geographic Society.

The meeting of January 10 was devoted almost wholly to business affairs. The following named gentlemen were elected to serve as managers for the ensuing three years: Alexander Graham Bell, Henry Gannett, A. W. Greely, Angelo Heilprin, Russell Hinman, W J McGee, Gifford Pinchot and Otto H. Tittmann. The secretary's report showed an increase in membership, the total being over 2,600.

At the meeting of January 24 Dr. L. A. Bauer, in charge of the Division of Terrestrial Magnetism, U. S. Coast and Geodetic Survey, gave an account of the magnetic survey of the United States now being prosecuted. The importance of an accurate knowledge of the variation of the magnetic compass was dwelt on at some length.

The present survey involves a determination of the compass variation throughout the United States and the publication of the results in such form as shall be most useful to those interested. Stations about 25 miles apart have been established for the purpose of ascertaining the compass variation, while four magnetic observatories have been installed at the following named places: Cheltenham, Md.; Baldwin, Kans.; Sitka, Alaska, and Honolulu, Hawaii. At these observatories complete records of all the magnetic elements will be obtained.

The second paper of the evening was by Mr. James Page of the Hydrographic Office, Navy Department, on Ocean Currents. Mr. Page showed that an intimate relation existed between the general atmospheric circulation and the system of ocean currents, and that the latter were due directly or indirectly to the frictional action of the wind. The rate of drift of ocean currents varies greatly; in extreme cases it might be as much as 75 to 100 miles in 24 hours, but generally it is very much less, not more than 20 to 30 miles in 24 hours.

A. J. Henry,
Secretary.

Science Club, University of Wisconsin.

At the December meeting of the Science Club of the University of Wisconsin, Decem-

ber 17, Professor T. C. Chamberlin, of the University of Chicago, gave an address entitled, 'Some Further Studies as to the Early States of the Earth.' The nebular hypothesis of the origin of the earth, as stated by Laplace, was discussed, and a brief summary made of certain tests to which the theory had been put by Professor Chamberlin and others, as described by Professor Chamberlin in various publications. It was concluded that the Laplacean hypothesis will not stand fundamental tests and that some modification of the hypothesis or some new hypothesis is necessary.

Professor Chamberlin's researches have furnished criteria for a new hypothesis of the origin of the earth. The parent body out of which the solar system was evolved must have been one which possessed limited matter; a very small proportion of matter near the exterior with very high energy of movement; in the central portion very low energy of movement, and with the conditions in the central portion permitting the development of a spherical body as the controlling center.

The earth in its early history may be conceived to have been a small body, growing gradually by the infall of material from without, without, in the early stages, an atmosphere, because of its incompetency to hold one. The atmosphere, instead of being the dominant phenomenon at the beginning of the earth, was practically absent from the exterior of the earth until it was $\frac{1}{10}$ or more grown. Gradually the accretion of the atmosphere permitted the gathering of water vapor, and this by condensation at length formed the oceans. These thenceforth protected the infalling matter of that portion of the earth, for matter falling into water does not undergo as ready decomposition as that which falls upon the surface. This process going on from age to age gave to certain areas a higher specific gravity than other portions. We therefore have an explanation of the superior gravity of the portion of the earth lying under these beds of water as compared with the land, and thus, perhaps, of the great depth of ocean basins.

It is obvious that from a very early stage volcanic action must have arisen from the excessive heat generated in the interior through self-compression of the mass, as may be shown by mathematical calculation. The volcanic action would affect certain substances before others, and the selection thus made from the time of its inauguration, when the earth was perhaps not more than $\frac{1}{80}$ or $\frac{1}{100}$ grown, is sufficient to explain the present distribution of volcanic matter.

Another phase of the history of the earth may be traced in this way: If the temperature of the interior is sufficiently accounted for by compression, the temperature developed by the infall of matter may have been made available for the sustenance of life at a very early period. Therefore we escape the objections raised by geologists against the prolonged era of evolution insisted upon by biologists.

C. K. LEITH.

THE ACADEMY OF SCIENCE OF ST. LOUIS.

AT the meeting of the Academy of Science of St. Louis on the evening of January 20, Dr. George Richter delivered an address on the physical and chemical properties of gelatin, which he described as a spongy substance differing materially from other solids. The manner of manufacture of gelatin and its chemical and physical characters were described in detail, and considerable attention was given to the rate of absorption and evaporation of water by gelatin, and the phenomenon of its apparent solution in water. A new hygrometer was exhibited and described, the action of which was based upon the water absorption of gelatin.

At the meeting on February 3, Mr. Trelease presented, with the aid of lantern illustrations, some of the principal results of his recent studies of Yuccas and their allies.

WILLIAM TRELEASE,
Recording Secretary.

DISCUSSION AND CORRESPONDENCE.

WIRELESS TELEGRAPHY.

TO THE EDITOR OF SCIENCE: I wish to enter formal protest against the statement concerning Wireless Telegraphy, on page 112, etc., of the issue of SCIENCE for January 17.

In anything that I may say let it be understood that I am not personal to Professor Franklin, who brings the editorial from London *Electrician* to our attention. The readers of SCIENCE need no statement from me as to Professor Franklin's qualifications.

It is too much the habit of scientists to be conservative about the application of scientific theory to commercial use. It seems to be an attitude which it is impossible to avoid; and the limitations of the individual are usually regarded as those of the science. For this reason I protest against the conclusions so hastily drawn in the present immature stage of the art of Wireless Telegraphy, viz., that it is practically incapable of any substantial extension. In this connection I quote from the *Scientific American* Supplement, the issue of August 5, 1882, page 5490, from an article called 'Electro-Mania' by W. M. Williams.

> I well remember making this journey to Boxmoor (upon one of the early steam railway carriages on the London and Northwestern Railway), and four or five years later travelling on a circular electro-magnetic railway. Comparing that electric railway with those now exhibiting, and comparing the Boxmoor trip with the present work of the London and Northwestern Railway, I have no hesitation in affirming that the rate of progress in electro-locomotion during the last forty years has been far smaller than that of steam. The leading fallacy which is urging the electro-maniacs of the present time to their ruinous investments is the idea that electro-motors are novelties, and that electric lighting is in its infancy; while gas lighting is regarded as an old, or mature middle-aged business, and, therefore, we are to expect a marvelous growth of the infant and no further progress of the adult.

This quotation is a type. Further, application of scientific theory to the affairs of man has from time immemorial been met by the scoffs not only of the ignorant (which may be borne with equanimity), but of those who ought to know better. The article by Mr. Williams was written after the birth of the dynamo, and he was doubtless incapable of distinguishing then between the old galvanic battery electric railways and those which followed the development of mechanical electric contrivances. We now know that the electric railway, so lightly characterized then, is an every-day matter involving the use of more capital than all other electric contrivances combined. The capital liabilities of the electric railways in the United States alone amount to $2,000,000,000; the telegraphs of the United States amount to $175,000,000, and the telephone systems of all kinds to a little less than $250,000,000.

Further, I protest that the entire article in the London *Electrician* is of the most unscientific character, utterly unworthy the attention of any one who tries to preserve fair-mindedness; and again that it misrepresents facts in the baldest manner; take such an example as this:

> The wireless channel of transmission will be rigorously avoided by business men, to whom a guarantee of secrecy and the certainty of a recorded message are absolutely indispensable. Wireless signals in the ether can never be secret; it must always be possible to intercept them. And messages received in no more permanent form than by sounds in a telephone are too evanescent and uncertain to commend themselves to the purposes of commerce.

And this in spite of the fact that the most enormous transactions are undertaken and consummated by telephone!

Ipse dixit predictions of this kind are unscientific. The scientist who has learned to distinguish between 'It can't be done' and 'I can't do it' has learned something which the evanescent gentleman who penned the article brought to our attention has certainly neglected. A caution against undue haste or boldness of prediction is all right; but predictions of what cannot be done are all wrong, and very much further wrong, because they neglect all the teachings of the past, and instead of adopting a Baconian philosophy would render it impossible for scientific men to obtain the means of pursuing investigations.

T. J. JOHNSTON.

SHORTER ARTICLES.

THE DISCOVERY OF TORREJON MAMMALS IN MONTANA.

LAST spring (1901), after it was decided that an expedition should be sent from Princeton

University to the region of the Musselshell river in Montana, the writer suggested to Professor W. B. Scott the possibility of finding fossil mammals in the Fort Union beds which are so well developed in the Crazy Mountains and vicinity. It was his idea that in a country where the Laramie, Livingston and Fort Union beds occur and attain a considerable thickness, the long-sought ancestors of the placental mammals of the Puerco might be found.

In the region where the camp was established, near Fish Creek, to the eastward of the Crazy Mountains, the writer had found, during the previous year, near the top of the series of rocks so beautifully exposed in this region, many fossil deciduous leaves. Many of these were in a hard, fine-grained sandstone and were excellently preserved. Below the layers of sandstone containing the best leaves were dark or gray shales in which were carbonaceous matter, plant impressions and distorted gasteropod shells, interstratified with layers of quite hard gray sandstone, which were often ripple marked. Still lower were dark gray shales with concretions, and bands or lenses of limestone containing fresh-water Bivalves and Gasteropods. The concretions are brown (ironstones) and break in angular fragments. The shales are partly soft and fine-grained and in part sandy.

During the greater part of last summer the writer was collecting for the Princeton Museum and was with the Princeton party during their stay in this region. In August, while ascending the butte from which leaves had been procured the previous year, and examining the dark shale beneath the sandstone cap, he found fragments of a tooth, which, when put together looked like the canine tooth of a mammal. Near it a premolar was found that at once settled the matter. It appears to belong to a small species of *Pantolambda*. This level was followed and carefully searched. Several teeth of *Euprotogonia* were found and fragmentary remains of one or two more mammals, besides teeth and fragments of jaws of crocodiles. This exposure was small. Afterward on another side of the butte, ravines which exposed the shales at about the same level were examined, and other bones and teeth were found.

These mammalian remains, which are now in the Princeton Museum, have been examined by W. B. Scott, M. S. Farr, and W. D. Matthew, as well as by the writer. One or two have been specifically determined and all agree that the beds belong to the Torrejon horizon. The fossils determined are:

Mioclænus acolytus (Cope),
Anisonchus close to *A. sectorius*,
Euprotogonia,
Pantolambda (?),
Psittacotherium (?).

This is a very interesting discovery, as heretofore Torrejon mammals have been found only in a limited area in New Mexico, and the beds have been searched with the greatest care, 'on hands and knees,' with a scientific zeal to know more of the peculiar mammals of this age.

The importance and interest of the discovery are doubled by the fact that everything seems to indicate that these are the Fort Union beds, the exact position of which has been uncertain. The collection of fossil leaves that was made in the summer of 1900 has been sent for with a view to the accurate determination of the species. As the Fort Union flora is a characteristic one it is confidently believed that the plants together with the mammals will settle the position of the Fort Union formation beyond controversy.

EARL DOUGLASS.

PRINCETON, N. J.

ENGINEERING NOTES.

ECCLES, a small town in England, has introduced the automobile fire-engine. It carries five men, three hundred feet of hose and standpipes, ladders, jumping sheet, etc. It is driven by an electric motor at a speed, on a smooth and level pavement, of about fifteen miles an hour. It climbs heavy gradients and is reported to be preeminently satisfactory. The self-propelled steam fire-engine has often been built, in the United States and abroad, and has sometimes proved satisfactory, though usually too heavy. The electric machine has at least one peculiar advantage in its instant

readiness for work. No delay is compelled as in starting fires and getting up steam or in waiting for horses, and immediately the alarm is heard, the attendant can jump upon his engine and start for the fire. In large cities, with their paid fire departments where the steam fire-engines always stand with water hot and steam making, and the horses and crews ready to move out of the house in intervals measured by seconds, this is a matter of less consequence; the engine will seldom fail to start promptly and to have steam ready before reaching its position at the fire. With small places, the case is very different. There, the engine is cold, no crew at hand, the horses often in a detached stable, or even at some distance, and in many cases hand-power only available. In such places, should a source of supply be at hand for charging batteries, the electric automobile fire-engine would prove ideal.

The advance made to date in the production of locomotives for heavy work is illustrated by the completion, recently, for the Atchison road, by the Schenectady Locomotive Works, of a ten-wheel engine weighing 275,000 pounds; while the progress of the business of locomotive construction is evidenced by the acceptance of orders by the Baldwin Works to an aggregate of seven hundred engines of all styles for the year 1902.

The Providence Journal owns an electric automobile, which has been working since the early autumn. It has traversed 1,000 miles and is expected to make the record 1,500 or 1,800 before its batteries will require replacement. The normal output is 22 amperes; but it has risen to 80 when ascending the hill to Brown University from Market Square. It has shown the practicability of rising a 10 per cent. gradient, although at serious cost in life of battery. It is estimated by the *Journal* that the cost is about that of keeping a single horse and carriage.

R. H. T.

BOTANICAL NOTES.

THE 'BROWN DISEASE' OF POTATOES.

For several years the potato crop of Nebraska has been seriously damaged by a disease which causes the fibro-vascular bundles to turn brown. This disease appears to be widely distributed in both America and Europe, but as yet nothing satisfactory has been published in this country concerning the cause of the trouble. About the first of March, 1901, Mr. J. A. Warren, now of the Santee Normal Training School, began a series of experiments in the botanical laboratories of the University of Nebraska in order to determine if possible what produced the disease. He now reports as follows: "My first cultures soon showed tufts of mould filaments projecting from the diseased bundles, and in a few days there were many ripe fruits of *Stysanus stemonites* (Pers.) Corda. I repeated the experiment many times, using both affected and unaffected tubers from different fields. In nearly every case the cultures containing brown bundles produced Stysanus, while those containing no brown bundles produced no Stysanus. Tubers grown at Lincoln, Harvard, Humboldt and Santee, Nebraska, and Cedar, Minnesota, were used, always with the same results. These experiments have now been continued for about eight months, and I hope to follow them the coming season. The results seem to show that *Stysanus stemonites* is the cause of the disease."

The importance of this discovery lies in the fact that this appears to be the first record which connects *Stysanus stemonites* with this disease in this country, as well as the first record of its occurrence.

MORE ON THE PHILIPPINE FLORA.

The Forestry Bureau of the Philippine Islands has issued a sixteen page pamphlet on the 'Tree Species,' giving the scientific and common names, the families and a little information in regard to the usefulness of the trees in the industries. No less than sixty-one families are represented, and the whole number of species enumerated is six hundred and twenty-two. The larger families are Urticaceae, with 45 species; Leguminosae, 42; Euphorbiaceae, 30; Myrtaceae, 28; Rubiaceae, 28; Sapotaceae, 24; and Lauraceae, 22. Of the Cupuliferae there are 13 species, two of which are species of Castanopsis, the remainder being

species of Quercus. There are 18 species of Palms (Palmaceae), and 5 of Coniferae. A solitary species (*Vernonia arborea vestita*) represents the arboreus Compositae of the islands.

A second publication of the same bureau, 'The Spanish Public Land Laws of the Philippine Islands,' is worthy of notice here. This consists of translations and compilations of the principal laws which governed the sale of the public lands in the islands under Spanish rule. It is worthy of mention that the Spanish laws made provision for the reservation of those tracts of land which are denominated 'forest zones,' and of which it is declared that 'the state desires to hold for the commonwealth.' It is further declared in regard to these forest zones that 'no private ownership can be claimed in them by any process of law, unless they are explicitly declared to be salable by competent authority.' One may wish that such wise counsels had prevailed when our forefathers took possession of the forest wealth of this country. Had this been done we should not now be trying to save the last of our forests by the reservation of such mere fragments as have escaped destruction because scarcely worthy of notice by the lumbermen.

ANOTHER TEXT-BOOK OF BOTANY.

A LITTLE book entitled, 'Outlines of Botany,' prepared by R. G. Leavitt, of the Ames Botanical Laboratory at North Easton, Mass., 'at the request of the Botanical Department of Harvard University' is very suggestive of the change which has taken place in our notions as to the proper study of plants in the high schools. Here is a book 'based on Gray's Lessons in Botany,' which is as different from the book of which it is supposed to be a modification as can well be imagined. In fact the preface indicates as much, when it speaks of many schools 'having outgrown certain now antiquated methods of teaching botany.' Instead of a book of lessons to be *memorized,* we have here a book to be *worked through* in the laboratory, with the proper material and appliances at hand. Only one feature of the new book has a familiar look, viz., the illustrations, over which some of us bent thirty-five years ago. All else is new, and to these old-time friends are added many new ones in order to illustrate the new topics and new treatment.

The treatment of the subject may be made out from the headings of the chapters, some of which are as follows: 'Laboratory Studies of Seeds and Seedlings,' 'Laboratory Studies of Buds,' 'Laboratory Studies of the Root,' and so on for the stem, the leaf, the flower, the fruit and the 'Cryptogams.' After each laboratory chapter there follows one of general discussion on the same subject. The closing chapters are devoted to the 'Minute Anatomy of Flowering Plants' and a 'Brief Outline of Vegetable Physiology.' The book is thus an introduction to modern botany, and since it is to be presumed that it has had the oversight of the eminent men in the Department of Botany in Harvard University, we need not be surprised at its excellence, although its author is yet a comparative stranger in botanical circles. We are glad to welcome the book as a valuable addition to the text-books for use in high schools.

INDIAN USES OF PLANTS.

IN a recent bulletin of the Division of Botany of the United States Department of Agriculture, Mr. V. K. Chesnut tells of the uses which the Indians of Mendocino County, California, make of a large number of plants, ranging from red seaweeds, fungi, lichens, ferns and conifers to flowering plants. Fibers, medicines and food constitute the principal uses which the Indians make of the wild plants of the region studied. One is astonished at the large number of fiber plants used by these people, and the question arises after reading this account whether the whites are not allowing valuable native fibers to go to waste. We have probably little to learn from the Indians in regard to the medicinal values of plants, but when we come to the food plants we are again inclined to wonder whether these primitive people may not be able to teach us to make better use of the products of the soil. The number of plants whose seeds yield wholesome food is very much larger than we had supposed possible. One curious feature in the food habits of these Indians is brought to

light, viz., that they eat clover (species of Trifolium), not the flower-heads, as white children do sometimes, but the leaves and stems, quite after the manner of other herbivorous animals! "From the beginning of April along into July it is no uncommon sight to see small groups of Indians wallowing in the clover and eating it by handfuls, or to see an Indian squaw emerging from a patch of clover and carrying a red bandana handkerchief full of the crisp stems."

Charles E. Bessey.

The University of Nebraska.

ELIZABETH THOMPSON SCIENCE FUND.

This fund, which was established by Mrs. Elizabeth Thompson, of Stamford, Connecticut, 'for the advancement and prosecution of scientific research in its broadest sense,' now amounts to $26,000. As accumulated income will be available November next, the trustees desire to receive applications for appropriations in aid of scientific work. This endowment is not for the benefit of any one department of science, but it is the intention of the trustees to give the preference to those investigations *which cannot otherwise be provided for,* which have for their object the advancement of human knowledge or the benefit of mankind in general, rather than to researches directed to the solution of questions of merely local importance.

Applications for assistance from this fund, in order to receive consideration, *must be accompanied by full information,* especially in regard to the following points:

1. Precise amount required. Applicants are reminded that one dollar ($1.00 or $1) is approximately equivalent to four English shillings, four German Marks, five French francs, or five Italian lire.

2. Exact nature of the investigation proposed.

3. Conditions under which the research is to be prosecuted.

4. Manner in which the appropriation asked for is to be expended.

All applications should reach, before April 1, 1902, the Secretary of the Board of Trustees, Dr. C. S. Minot, Harvard Medical School, Boston, Mass., U. S. A.

It is intended to make new grants in April, 1902.

The trustees are disinclined, for the present, to make any grant to meet ordinary expenses of living or to purchase instruments, such as are found commonly in laboratories. Decided preference will be given to applications for small amounts, and grants exceeding $300 will be made only under very exceptional circumstances.

A list of the grants recently made is given below.

(Signed.)

Henry P. Bowditch, *President.*
Charles S. Rackemann, *Treasurer.*
James M. Crafts.
Edward C. Pickering.
Charles-Sedgwick Minot, *Secretary.*

1900.

$200, to Dr. H. H. Field, Zürich, Switzerland, to aid in the publication of a card catalogue of biological literature.

$500, to S. H. Scudder, Esq., Cambridge, Mass., for the preparation of an index to North American Orthoptera.

$300, to Professor P. Bachmetjew, Sofia, Bulgaria, for researches on the temperature of insects.

$250, to Dr. E. S. Faust, Strassburg, Germany, for an investigation of the poisonous secretion of the skin of Amphibia.

$250, to Professor Jacques Loeb, Chicago, Ill., for experiments on artificial parthenogenesis.

$650, to the National Academy of Sciences, Washington, D. C., towards the expenses of three delegates to attend the conference of academies at Wiesbaden in October, 1899, to consider the formation of an International Association of Academies.

1901.

$150, to Professor E. W. Scripture, New Haven, Conn., for work in experimental phonetics.

$300, to Professor W. Valentiner, Heidelberg, Germany, for observations on variable stars.

$50, to A. M. Reese, Esq., Baltimore, Md., for investigation of the embryology of the alligator.

1902.

$125, to F. T. Lewis, M.D., Cambridge, Mass., for investigation of the development of the vena cava inferior.

SCIENTIFIC NOTES AND NEWS.

THE American Philosophical Society has elected Dr. Samuel P. Langley, secretary of the Smithsonian Institution, to be vice-president of the Society, and Dr. Ira Remsen, president of the Johns Hopkins University, to be one of the councilors.

'THE Races of Europe,' by Professor W. Z. Ripley, of the Massachusetts Institute of Technology, and professor-elect of economics at Harvard University, has been 'crowned' by the award of the prix Bertillon of the Société d' Anthropologie of Paris.

PROFESSOR J. W. GREGORY has been appointed acting head of the Geological Survey of Victoria, with a view to its reorganization.

M. MICHEL LEVY, inspector of the French mines, has been appointed a member of the council of the Conservatory of Arts and Measures.

THE foreign papers report that Professor Virchow, who has been confined to the house as the result of a fall, is making good progress towards recovery.

THE Medical Advisory Board of the Health Department of New York City has organized by electing Dr. Edward G. Janeway chairman and Dr. T. Mitchell Prudden secretary.

DR. F. W. PAVY, F.R.S., has been chosen president of the National Committee for Great Britain and Ireland at the Fourteenth International Congress of Medicine to be held at Madrid in April, 1903.

DR. JOHN D. JONES, formerly assistant chief of the bureau of forestry, and more recently a representative of the Department of Agriculture for the purpose of investigating the condition of agriculture in Asia, Hawaii and the West Indies, was appointed in June, 1899, as technical adviser to the Japanese department of agriculture and commerce. In recognition of his services the Emperor has recently conferred on him a high order.

DR. SAMUEL G. DIXON, president of the Philadelphia Academy of Natural Sciences, has been formally notified of election to honorary membership in the National Society of Natural Science and Mathematics, Cherbourg.

DR. J. W. LOWBER, of Austin, Tex., has been elected a fellow of the Royal Astronomical Society of London.

DR. T. H. MACBRIDE, professor of botany in the State University of Iowa, has been invited to deliver the address at the opening of the new library building at Muscatine. The address is to be given under the auspices of the Fortnightly Club of that city.

IN a course of lectures at Trinity College, Professor H. S. Graves, of Yale Forest School, will give 'Problems of American Forestry' March 11, and Rev. Henry C. McCook, D.D., 'The Homes and Habits of American Ants.' In addition Dr. McCook will address the students of the department of natural history upon spiders.

THE Navy Department has extended for six months the leave of absence granted to civil engineer Robert E. Peary, now in the Arctic regions.

DR. EDWARD PALMER, the veteran explorer of Mexico, left Washington on January 15 for a collecting expedition in the province of Santiago, Cuba. He will obtain the usual number of sets, which will be offered for sale upon his return. Dr. Palmer will be accompanied by Mr. Charles Louis Pollard and Mr. William Palmer, both of the United States National Museum, who will collect plants, mammals, birds and reptiles for that institution. As the party will pay especial attention to the unexplored mountains in the southern portion of the province, it is expected that the scientific results will be valuable.

PROFESSOR RALPH S. TARR, of Cornell University, is spending the winter in geological study in Italy and will spend the spring and summer in the study of the glacial deposits of Germany and the British Isles.

Nature states that an expedition to Lake Eyre, the great depression in Central Australia sinking below sea-level, has recently left Melbourne. The party consists of Professor J. W. Gregory, his assistant, Mr. H. J. Grayson, and five students of the geological department of the Melbourne University. The main objects of the expedition are the study of the

physical history of the Lake Eyre basin and the collection of fossils, especially the extinct giant vertebrates. The camel caravan starts from Hergott Springs, a station 440 miles north of Adelaide. It is hoped that the collections will throw light on some unexplained native traditions as to former giant animals that inhabited the Lake Eyre basin.

A BUST of Sir Frederick Bramwell has been presented to the Royal Institution, of which he was formerly honorary secretary.

AT the celebration of University Day at the University of Pennsylvania on February 22, a portrait of Benjamin Franklin, by Gainsborough, will be presented by the class of 1852.

DR. PAUL F. MUNDÉ, the well-known New York gynecologist, at one time professor at Dartmouth College, died on February 7, aged fifty-five years.

ALFRED BRASHEAR MILLER, D.D., LL.D, president emeritus of Waynesburg College, Waynesburg, Pa., died on January 30, aged 72 years. He had been identified with the college from its foundation in 1851, having been president for 40 years and president emeritus three years.

COMMISSARY-GENERAL G. D. LARDNER, an Englishman who contributed to the advancement and popularization of astronomy, has died at the age of eighty-four years.

THE British National Physical Laboratory at Bushy House will be officially opened on March 19.

AT the annual meeting of the Association of American Universities which opens at Chicago on February 24, the following four main questions will form the basis for discussion:

(1) 'The scope and character of the dissertation required for the degree of Doctor of Philosophy'; (2) 'The membership and policy of the Association of American Universities: Should it be enlarged, and, if so, under what principle of selection? Should the Association devote its attention to questions of graduate work in the arts and sciences exclusively, or shall it also consider and include law, medicine, theology, and political science?'; (3) 'What is research in a university sense, and how is it best promoted?' and (4) 'The degree of Master of Arts: Shall the granting of this degree be encouraged, and, if so, what should it mean, and under what conditions shall it be given?'

These four topics have been assigned respectively to the University of Chicago, the University of California, Clark University, and Cornell University.

THE annual congress of the British Sanitary Institute will be held in Manchester on September 9–13. The section of sanitary science and preventive medicine will be presided over by Sir J. Crichton Browne; that of engineering and architecture by Sir Alexander Binnie; and that of physics, chemistry and biology by Professor A. Sheridan Delpéine.

THE board of directors of the American Academy of Political and Social Science, at its annual meeting in Philadelphia, elected the following officers: Professor Leo S. Rowe, *President;* Samuel McCune Lindsay, Franklin H. Giddings and Woodrow Wilson, *Vice-Presidents;* James T. Young, *Secretary.*

AT the annual meeting of the Peary Arctic Club, the present officers were reelected: M. K. Jesup, *President;* H. W. Cannon, *Treasurer;* and H. L. Bridgman, *Secretary.* Resolutions were adopted congratulating Lieutenant Peary on rounding in 1901 the northern end of the Greenland Archipelago.

A CIVIL service examination will be held on March 25 to fill the position of computer in the Bureau of Forestry, at a salary of $1,000 a year. On the same day an examination will be held for the position of piece-work computer in the Naval Observatory and also for a similar position in the Nautical Almanac Office. On March 4 there will be an examination for the position of seed laboratory assistant in the Bureau of Plant Industry, at a salary of $720.

THE feasibility and advisability of adopting the metric system of weights and measures in the United States will be the subject of discussion at a stated meeting of the Franklin Institute of Philadelphia on February 19. The basis of the discussion will be the report of a special committee, which is as follows:

WHEREAS, It is desirable to obtain an international Standard of Weights and Measures, also

to simplify and regulate some of our existing standards; and,

WHEREAS, The Metric System is commendable not only as a suitable International Standard, but also for facility of computation, convenience in memorizing and simplicity of enumeration;

Resolved, That the Franklin Institute approves of any movement which will promote the universal introduction of the Metric System with the least confusion and expense.

Resolved, That the National Government should enact such laws as will ensure the adoption of the Metric System of Weights and Measures as the sole standard in its various departments as rapidly as may be consistent with the public service.

AT a recent meeting of the convocation of the University of London the following resolution was passed: "That this House is of opinion that, in the interests of commerce, science and education, legislation should be promptly undertaken to make compulsory in this kingdom, after a proper interval, the use of the metric system of weights and measures for all purposes."

WE take the following items from the current issue of *The Botanical Gazette:* Dr. E. B. Copeland, formerly of the University of West Virginia, is engaged in research work at the University of Chicago.—Dr. Bradley M. Davis, of the University of Chicago, has returned to his work from a stay in Paris.—Miss Josephine E. Tilden, of the University of Minnesota, has returned from an exploring trip on the Vancouver coast.—Dr. John M. Coulter, formerly of Syracuse University, has been appointed professor of botany in the Manila Normal School, Philippine Islands.

MR. S. HARBERT HAMILTON has started on a scientific exploring and collecting trip in the vicinity of Santiago, Cuba. Collections will be made in all branches of natural history, the bulk of which will go to The New York Botanical Gardens, The American Museum of Natural History and The Academy of Natural Sciences of Philadelphia. Specialists or institutions desiring material direct from the locality are invited to correspond with Mr. Hamilton at Santiago, Cuba.

AT a meeting of the Zoological Society of London on December 3, a series of papers on the collections made during the 'Skeat Expedition' to the Malay Peninsula in 1899–1900 was read. Mr. F. G. Sinclair reported on the Myriapoda, and enumerated the forty species of which specimens had been obtained. Of these, nine were described as new to science. Mr. W. F. Lanchester contributed an account of a part of the Crustacea, viz., the Brachyura, Stomatopoda and Macrura, collected during the Expedition, and described six new forms. Mr. F. F. Laidlaw enumerated the Snakes, Crocodiles and Chelonians which had been obtained, and described two new species based on specimens in the collection. An appendix to these papers, drawn up by Mr. W. W. Skeat, contained a list of names of the places visited by the members of the 'Skeat Expedition.'

OUR consul general at St. Petersburg writes to the Department of State that the gradual deforestation of Russia is attracting increased attention throughout the Empire, and the Forestry Society, as well as the forestry department of the Ministry of Agriculture and Domains, are discussing means for regulating the consumption of timber and for propagation. 'Wooden Russia,' as it is familiarly called, does not appear to be in any immediate danger, as a recent official report states that forests in this country now cover a gross area of 188,000,000 hectares (464,548,000 acres). Among European countries, Sweden comes next, with 18,000,000 hectares (44,478,000 acres) of forest. In Russia, the forests cover 36 per cent. of the whole imperial area. The Swedish forests occupy 44 per cent. of the total area, and the Austro-Hungarian 32 per cent. of the territory of the Dual Monarchy. Reckoned by the population, there are 2 hectares (4.9 acres) of forest to each inhabitant in Russia, 3.85 hectares (9.5 acres) in Sweden, 4.22 hectares (10.4 acres) in Norway, and 0.28 hectare (0.69 acre) per head in Germany. The forests have a greater importance for Russians than for people of West European countries, as villages and country houses are largely built of wood, stone and brick houses being almost unknown, and the forests furnish the main sources of fuel supply. While the imperial committee complains that it is private owners who are recklessly devastating the forests and urges that adequate laws and regulations be

enacted to prevent this, the Forestry Society calls attention to the fact that, according to the official report of the forestry department of the Ministry of Agriculture and Domains, the Crown forests furnished a revenue of 17,600,000 rubles ($9,064,000) in 1890 and 48,000,000 rubles ($24,720,000) in 1899. It is claimed that this advance in nine years could not be due to the natural increase of timber growth, and it is urged that the Government set an example in moderation.

UNIVERSITY AND EDUCATIONAL NEWS.

THE Laboratory of Engineering, presented to the Stevens Institute of Technology by Mr. Andrew Carnegie, at a cost of $55,000, was dedicated on February 6. Mr. Carnegie made a speech and was presented by President Morton with a silver box containing a piece of the first 'T' rail ever made, the rail that was invented by Robert L. Stevens and was made in 1830 by Sir John Guest at his works in Wales, under the personal supervision of Mr. Stevens.

THE new Hall of Liberal Arts of the State University of Iowa, erected and equipped at a cost of about $200,000, was dedicated on January 23.

WAYNESBURG COLLEGE celebrated its semi-centennial anniversary in November last at which time gifts to the endowment amounting to $36,000 were announced. Col. J. M. Guffey, of Pittsburg; J. V. Thompson, Esq., of Uniontown, and Timothy Ross, John Rose and T. J. Wisecarver, of Waynesburg, contributed $5,000 each. The enrolment of students last year was 391.

MR. WARREN A. WILBUR, of South Bethlehem, Pa., has given an additional $5,000 for the equipment of the new mechanical laboratory at Lehigh University.

THE midwinter edition of the Cornell University *Register*, just published, gives the first official and precise census for the current year. The figures are the following: Trustees, 39; teachers, 387; students, graduate department, 183; graduate students in undergraduate departments, 185; academic department, 817; law school, 197; medical college, 415; college of agriculture, 86; veterinary college, 51; college of forestry, 38; college of architecture, 50; college of civil engineering, 212; Sibley college (mechanical, including railway, electrical, marine, etc.), 784. The total of all classes and courses is 2,792 in the regular lists and about 500 in the summer schools. Of the total 1,679 come from New York State, the remainder from every State in the Union and from all parts of America and of the British Empire, from China, Japan, Russia, Switzerland, Austria, Turkey and Korea. Of the 784 students in the undergraduate courses of Sibley College, 62 are graduate students; there are also 14 candidates for the Master's degree and 2 graduate students not candidates for a degree. There are 4 candidates for Ph.D., taking their major work in M.E., and one D.Sc., making a total for 1901–2 of 805 students in all classes and courses.

THE Wesleyan University Summer School of Chemistry and Biology will be organized in July, 1902, and will be open for a period of four weeks. It will be in charge of Professors W. O. Atwater, W. P. Bradley and H. W. Conn, aided by a number of assistants.

PROFESSOR WILLIAM L. ROBB, of Trinity College, has been appointed head of the new department of electrical science in the Rensselaer Polytechnic Institute, Troy, N. Y.

DR. GEORGE E. DE SCHWEINITZ, of Jefferson Medical College, has been appointed professor of ophthalmology in the University of Pennsylvania to succeed the late Dr. W. F. Norris.

MISS SUSAN M. HALLOWELL has resigned the professorship of botany at Wellesley College, and has been made professor emeritus. Miss Hallowell was appointed professor of natural history on the opening of the College in 1875.

AT Cambridge University Professor T. H. Middleton has been elected professor of agriculture in the place of Dr. Somerville.

DR. DAVID WELSH, the senior assistant to the professor of pathology in the University of Edinburgh, has been elected the first professor of pathology in Sydney.

THE Senior Mathematical Scholarship at Oxford has been awarded to Arthur W. Conway, B.A., Corpus Christi College.